

**1960 TAPE
RECORDING
CONTEST** See
page 17

T A P E

RECORDING AND HI-FI MAGAZINE

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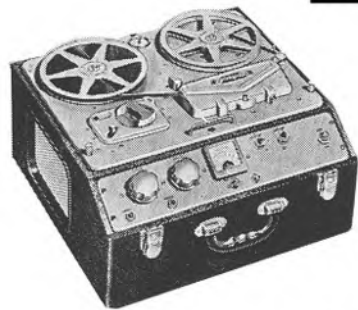
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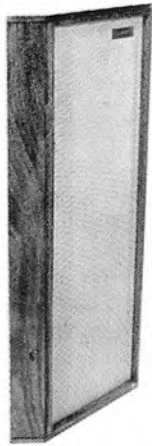
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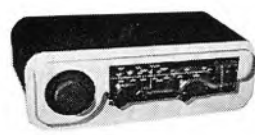
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Over 12 hours playing time from one $5\frac{1}{2}$ " DP Tape—4 track selection and super-imposition facilities.

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Please obtain for me the following IRISH tape

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TIP OF THE MONTH by Mr. Irish

Before connecting a lead from the radio to your amplifier or tape recorder, make sure that the radio is not a universal AC/DC set. With such radios the chassis is often "live" and thus, when plugging into an earthed device, one can receive an unpleasant, if not dangerous, electric shock. If in doubt consult your dealer.



Brown Band (Acetate base)

600'	5" spool	17/-
850'	5 $\frac{3}{4}$ " spool	23/-
1,200'	7" spool	27/6



Long Play * (Mylar base)

900'	5" spool	28/-
1,150'	5 $\frac{3}{4}$ " spool	35/-
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* Ferro-sheen process

Studio Quality

NO OTHER TAPE RECORDER HAS ALL THESE FEATURES

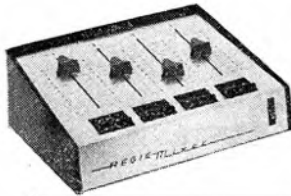
SABA

- ★ Automatic tape reversal enables the recorder to play continuously.
- ★ The SABA "Trick Switch" enables blending and synchronisation of voice over music and other combinations.
- ★ Frequency range 30 to 20,000 cycles at 7½" per sec.: 40 to 16,000 cycles at 3½" per sec.
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- ★ Re-winds at 30 times normal playing speed.
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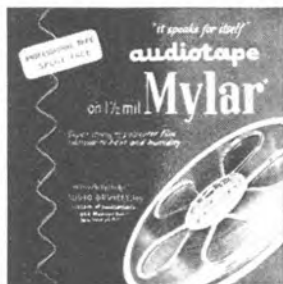
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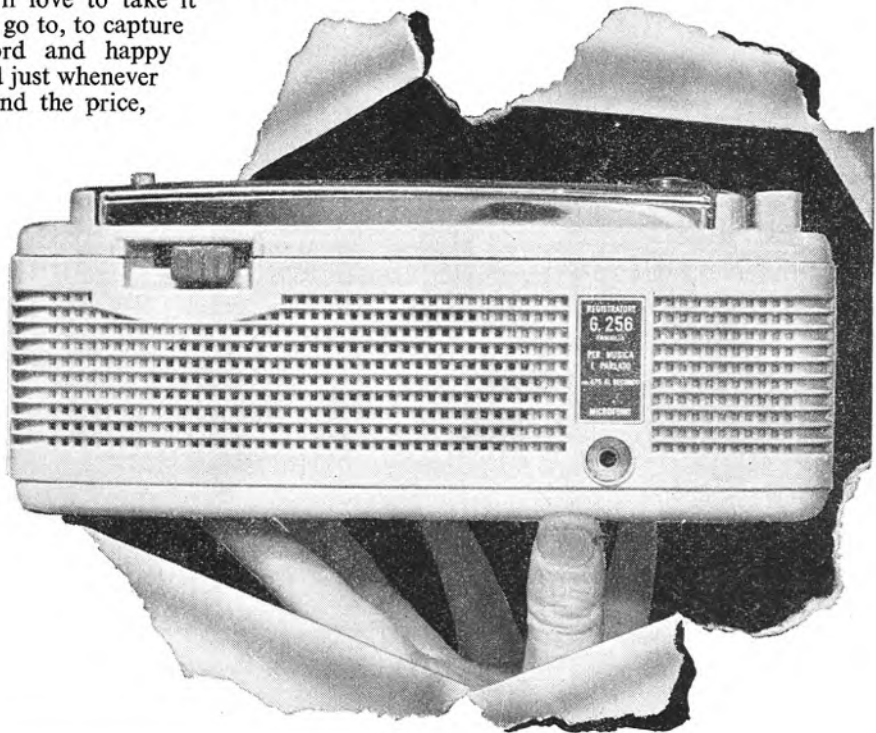
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Model Stereo 808 105 gns.

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We believe that a Tape Recorder, being an instrument of high mechanical precision, needs a great deal of critical and unhurried supervision at every stage of its manufacture which it would be difficult to carry out in a factory geared to large-scale production.

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EDITORIAL

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We take the view . . .

A DIGEST OF

NEWS, COMMENT AND

EDITORIAL OPINION

I HAVE spent a couple of recent weekends recording trains with a Steelman Transistape, the latest, and one of the most attractive, of the lightweight battery portable recorders. I was anxious to capture, while there is still time, the sounds of the "Flying Scotsman" pounding up the gradient near my home. During this year steam locomotives will disappear from this train; already, it is often diesel-hauled.

So I have been thinking about the sounds which may become historic in our lifetime—the things that we should go out and get on tape quickly, before they are lost for ever.

And, listening to a B.B.C. programme recently, in which the late Robert Donat recited poetry, I was struck by another idea, when the narrator told us that one of the recitations had been unexpectedly discovered on an unlabelled tape which had been thought to be blank.

We now enter a period when there are exciting discoveries to be made of recordings which are not generally known to exist. What sounds have already been stored for us, but remain uncatalogued? Just as, today, an occasional lucky fellow goes into an attic and discovers an Old Master, soon there will be the chance that we may stumble across valuable, unsuspected sound pictures.

Take these examples

STILL on the subject of the B.B.C., have you heard the succession of programmes recently which have pointed the way for amateur recording enthusiasts who want to make their own family sound albums?

First we had Audrey Russell's personal review of the year just ended, "This Year of Summer," in which she collected sounds, music and voices that evoked memories of the year she had spent. They covered, among other things, fashion, the theatre, films, the weather, the general election, and World Refugee Year.

Have you thought of compiling such a collection of recordings to tell the story of *your* year? If you did not collect suitable recordings in 1959 to make this possible, why not start now with a record of 1960?

LAUGH WITH JEEVES

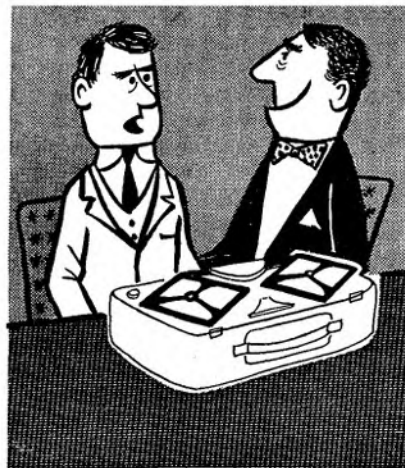


"Careful Harrison, it may be copyright"

AND NOW—

A NEW CARTOONIST

Now we introduce another brilliant cartoonist, whose work will appear regularly in our columns. "Rich" will present the adventures and misadventures of a character called Hi-Fi Harry, an enthusiast if ever there was one, but a man with notable idiosyncrasies. He promises you a laugh in each issue, starting with this:



"Tell me Harry, when did you record these square-dance tapes?"

Collecting folk music

PART of the B.B.C. Library consists of a collection of folk music, started in 1952, which is now unique. Already many of the items recorded for it belong to the past—they were taped only just in time.

Douglas Cleverdon, the B.B.C. producer, told me recently of an experience years ago when he drove to Dorset to make such a recording, and arrived in time to hear that the subject of his recording had died that day.

At present, the B.B.C. is transmitting an interesting series of programmes about pioneer folk song collectors, under the title "As they roved out." We have already heard the stories of Alfred Williams, of Wiltshire, and Lady Herbert Lewis, who collected Welsh folk songs.

Tomorrow (January 14) there will be a programme about Lucy Broadwood, and on succeeding Thursdays we shall hear about Seamus Ennis, an Irish collector, Gavin Greig, in Scotland, and Mrs. Kennedy Fraser.

For many of these pioneers, the task was more difficult than it is today. They lacked the simply mechanical aid of the tape recorder. But their example can be an inspiration to those who can now get out into the villages and gather in material which is fast disappearing.

World of Tape

A NEWS DIGEST

Under-sea recording

SCIENTISTS diving off the coast of Guam, in the Pacific, in the record-breaking bathyscape are using a £7,000 tape recorder. It records four tracks on half-inch tape simultaneously.

Track one takes an orthodox sound commentary by a human observer. Track two records the sounds of the surrounding sea as the bathyscape dives.

The other two tracks record all the scientific information about light, temperature, pressure and so on.

World school link

SCHOOLS which have been in contact by exchange of tape recordings were directly linked by radio for a New Year's Eve programme broadcast by RTF, the French radio network.

Schools in Paris and in the small island of Réunion, in the Indian Ocean, spoke to one another and were then linked with others in Canada, the United States, Japan, Poland and the Soviet Union.

The programme was organised by M. Jean Thévenot, well known for his work for the International Federation of Sound Hunters, and M. Pierre Guérin, secretary-general of the Centre International Scolaire de Correspondance Sonore.

Avoiding draughts

VILLAGE halls and social centres in small towns are snug enough when you get inside, but wind and rain can fray tempers when queues are forming at the doors for the formalities often necessary before meetings.

With the help of a tape recorder Mrs. Garnet Skinner, of Sidmouth Valley Townswomen's Guild, Devon, has found a way of cutting out the draughty wait at the door.

As each member arrives the name is announced with the amount of the subscription handed over to Mrs. Skinner. Members hardly have to pause as they go through to the warmth within, for their words are picked up by Mrs. Skinner's recorder. Then, in the comfort of her fireside, Mrs. Skinner plays back the recording, makes up her books and prepares receipts.

Unique library

OXFORD University Opera Club has just added a new recording to its impressive library of tape recordings made over the last nine years. It is of Moussorgsky's "Khovanshchina," which was the Club's 1959 production. The library includes the only complete recording in the world of Bizet's "Fair Maid of Perth," which the Club produced in 1955.

All the top stars are at home now with a tape recorder. Just look at that relaxed pose by lovely Anne Heywood (right) as she settles on the carpet with a microphone in one hand and a script in the other.

But wait Norman Wisdom (below) looks anything but happy as he confronts a microphone. Jerry Desmonde is inveigling Norman into making a recording. It happens in their latest film, "Follow a Star," which is just being generally released.

A tape recorder plays a vital part in the plot of the story, and you will see some good close-ups of well-known Grundig machines in the film.

And . . . hi, here's someone else who doesn't know how to treat a good recorder. Michael Bentine, in that odd moon-explorers' outfit below, is



STARS AND SPOOLS



putting on to tape his impressions of a landing on the moon. It is not quite clear what his son, Gus, proposes to do with the hammer, unless it is to add sound effects!

Michael Bentine's impressions were a very special treat for some of the youngsters who attended the Schoolboys' Own Exhibition at Olympia this month.

EAP (Tape Recorders) Ltd, set up a Moon Report Station at the Exhibition and invited visitors to sit in a space cabin, imagine they had landed on the moon, and report back to earth. Their reports were recorded and the best of them won Elizabethan Band-box recorders—with Bentine's report on the tape.



Stereo Notes

By D. W. GARDNER

1959 WAS THE YEAR OF THE BREAK-THROUGH

PERHAPS the most important thing that has happened in 1959 in connection with stereo is what, in advertising parlance, would be called the "break-through." During this year stereo ceased to become predominantly a matter of speculation and became instead something of known value.

The complete assembly may not always be acquired at once, but acceptance of the general principle has meant that individual enthusiasts are installing an extra speaker, a stereo amplifier, a stereo cartridge or other piece of equipment that can be put to good use straight away, while bringing full stereo a step nearer.

It is now widely realised, for example, that when one buys a stereo amplifier with an output of 5 watts per channel the total power of 10 watts can be used immediately on monophonic recordings.



What of 1960? One of the big questions is whether stereo broadcasting will be launched on a major scale before the year is out. The BBC have been accused of not being serious about stereo. Certainly, the Corporation seems to be in no hurry to finalise its plans but, on the other hand, a great deal of work is being done on the programme side and it is unlikely that the BBC would allow all this material to be wasted.

Will 1960 also see an advance in the crucial matter of the integration of stereo into the home? A great deal of resistance still comes from wives who realise that two speakers badly placed from the furnishing point of view can spoil a decorative scheme. This is to some extent a problem for the loud-speaker manufacturers, but help can be provided by designers in general, including amateurs. I, for one, shall be glad to have sketches or photographs from readers showing ways in which they have tried, or plan, to integrate their equipment attractively into the home.

It would be particularly useful if special efforts could be made when enclosures are sold in pairs for stereo. If they are large units castors might be fitted automatically unless the buyer requests otherwise. A matching unit could also be offered for "garaging" the two enclosures together neatly when not in use.

Why not record—and file—your family history, your book reviews, the best speeches you hear? In this article, WILLIAM R. PHINNEY, of New York, advises you on how to

Build your own tape library

TRADITIONALLY, a library is conceived to be either a collection of books or the place where such a collection is housed. Today, however, we are seeing the emergence of a new meaning; increasingly we hear of libraries of recordings, generally thought of in terms of discs, and of discs containing music. Is it not just as proper to think in terms of tapes, and of tapes containing speech and other forms of sound, as well as music?

Every owner of a tape recorder is bound to accumulate tapes which he does not care to erase and to which he expects to make reference from time to time. These constitute his library, whether there be many tapes or few, and whether they be consciously and systematically housed or simply allowed to accumulate in a dresser drawer or on a bookshelf.

My own experiences in the use of a tape recorder have led me to the point where I have accumulated hundreds of tapes in a catalogued collection. The items range all the way from half-a-dozen three-inch reels of personal correspondence to a number of 10½-inch reels of Christmas music and operatic selections. Except where fidelity is a major feature when the tapes are recorded at 7½ ips—the speed used is 3½ inches. Had I been able to employ a slower rate I should probably have done so where speech alone is involved.

I must confess that my preference is for five-inch reels. A five-inch reel can be mailed more readily and economically than a seven-inch. It is small enough to be readily slipped into one's coat pocket. It permits a half-hour recording to a side, entirely adequate for many uses. It fits my VU Magnemite battery-operated recorder, hence I can lay aside, along with the rest of my tapes, actuality

recordings and lectures and the like which I have made on this machine.

Many of my tapes are contained in metal cans sealed with masking tape. Others are in the conventional cardboard boxes. Each of the boxed tapes is first slipped into a plastic bag, to retard tape drying and to guard against dust.

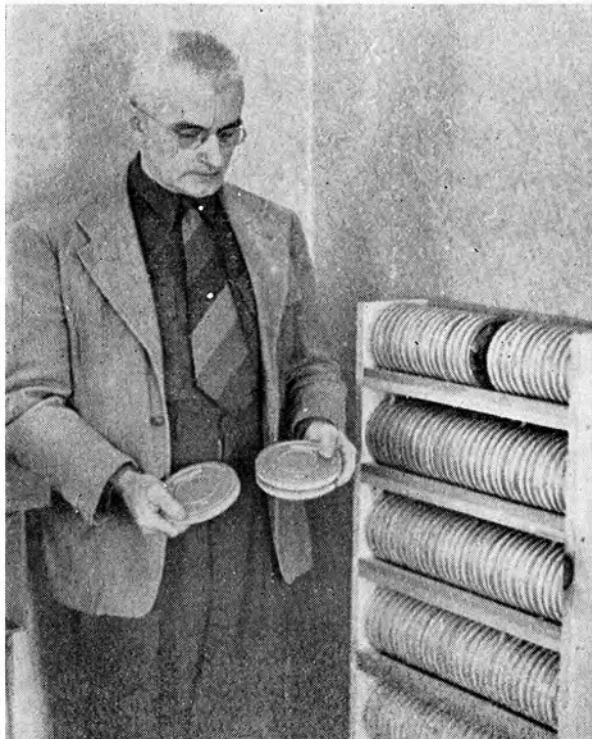
Out of scraps of lumber and odds and ends of plywood, book cases have been made, the shelves spaced to give ample room to five-inch reel cans stood on edge. A narrow strip of wood nailed along the front edge of each shelf prevents the cans from rolling off, and the plywood back stiffens the whole and allows nothing to spill off the back edges of the shelves.

By lettering each shelf and putting a corresponding letter on each can, together with a number to indicate the position of that particular tape on that particular shelf, I am able to file my tapes and, by means of a card index system, can quickly and efficiently track down any tape I wish. It might be said parenthetically that, had I slanted each shelf downward at the back, I need not have put a strip along the front edge to keep the reel cans in place.

What do I find to put into this library?

All sorts of things of particular interest to me. Where no restrictions are involved, a wealth of material can be gleaned from the radio and television. Press interviews with notable people I generally save; I can often gain a more adequate picture of a man like David Ben Gurion or Robert Frost—who, it may be interesting to note, first secured public notice across in Great Britain—from such an interview than from long hours spent reading a formal biography.

Outstanding news reports, travel descriptions, items sent me by friends who know my interests, folk music, addresses delivered at the Rotary Club of particular appeal to me, and a hundred and one other things find their way into my library.



The author is seen in these two photographs—left, with his library of recorded tapes, and right, with the recording equipment he uses

It has become my custom whenever I read a book, be it fiction or non-fiction, to review that book on tape, using either a half-hour or an hour, the review being wholly for my personal consumption later. Incidentally, if a book has not been worth reviewing, then it has not been worth reading. These reviews go into my library.

I have made this discovery: since I have been following this practice for several years now, the mere mention of a title or an author will bring to mind far more than was the case before I began making such reviews. If I desire to spend a quiet evening with Sir Walter Scott or Anthony Trollope, or travelling in Tibet, I have the resources within my own library.

Such a collection as this is always in the process of being brought up to date. Some items which seemed of real interest at the time they were put away, are of little worth to me now; these I erase and replace with more recent acquisitions.

The things that wear well stay in my library: the minute description by an elderly church historian of the centuries-old church in his parish in England; two or three on-the-spot recordings by experts connected with the findings of the Dead Sea Scrolls; a lecture on Chinese "brainwashing," another by a college professor concerning witchcraft; a composite tape of my own devising telling the story of the maple sugar industry which flourishes here among the mountains.

There are two or three reels of a recorded conversation which I had with my father, now in his late 80's, of memories of his father, an itinerant shoemaker born in 1816. A tape of signal importance to my wife contains the voices of her father and mother, now deceased.

What a wealth of material I might have gathered had tape recording come into popular use some years ago, when some of the Civil War veterans were still alive and telling their fascinating stories, and when elderly members of my own family were relating many of the incidents of their early days!

When I can, I use my Tapesonic 70-A to record the programmes. Its VU meter gives me a control over my recording scarcely possible with any other kind of indicator. A Wollensak 1500 has proved to be very handy in making dubbings. I use it almost exclusively in listening to tapes, for it may easily be carried about. If the evening TV programme is not to my liking, a tape on the recorder and my ear-phones in place, make me independent of my surroundings. I can have my pleasure without annoyance to those about me.

Visits to such places as the old Senate House in Kingston, New York, and to the ancient Huntingdon House, in Hadley, Mass., were made with the portable; battery-operated recorder. On-the-spot documentary tapes were made, using principally the voices of the guides showing visitors through and answering numerous questions put to them.

Many of the recordings I have shared with others; and recorder enthusiasts the world over have willingly supplied me with their treasures. Welsh hymn singing, native Maori songs, the Queen Mother visiting church in Auckland, New

Zealand: these are as close to me as my own library shelves.

Accumulating tapes is like adding books to a conventional home library; there are always some one longs for and hopes some day to possess. I hope one day to visit the Russian Orthodox monastery at Jordanville, there to make an actuality recording. I expect to interview one or two old-time hop growers to hear their tales of the early days; to visit a still among the Adirondacks where cedar oil is produced; and to go down into Howe Caverns, accompanied by a guide, hundreds of feet into the limestone bed rock of Schoharie County.

The owner of a tape recorder need not possess expensive equipment in order to build a very creditable library. It helps to have access to a second recorder since it is essential if dubbings are to be made. A person need not be an expert at making a tape, since a library is usually very personal and is probably created primarily for one's own enjoyment and edification.

Little has been said here about music. But much that has been said applies as much to music as to the human voice, or any other sounds. Those who have access to folk music may very well add tapes of real significance to their libraries. If the popular music of the day be an interest, the opportunities to make and preserve one's own recordings are almost limitless.

If one likes poetry, the aid of a good reader may be enlisted to preserve on tape an anthology pleasing to the recording enthusiast.

Tapes, like books, can have lasting value. Tapes, unlike books, can be erased and "written" over again. A book that has passed beyond its usefulness goes into the discard; a tape simply has its sound changed, and is as good as new.

The **HEART** of a good tape recorder is its **DECK!**

How true this is when it comes to obtaining first-class performance from your recorder. No wonder those enthusiasts who really demand the best—who spend many happy hours experimenting with sound insist on using a Brenell Mk. 5 Deck. The deck which has proved to many a proud owner over and over again that this is indeed a machine designed and built for the service demanded of it.

“Without a shadow of a doubt the right deck makes all the difference to performance—that’s why a Brenell Mk. 5 is included in my equipment.”

says MR. R. A. MARGOSCHIS
of Atherstone, Wars.

Documentary Section WINNER

British Amateur Tape Recording Contest

Documentary Category B RUNNER-UP (2nd)

International Tape Recording Contest

MK. 5 DECK—Four recording speeds: $1\frac{7}{8}$, $3\frac{1}{2}$, $7\frac{1}{2}$ and 15 i.p.s. Permits use of $8\frac{1}{4}$ in. reels (3,600 ft. of D.P. tape at $1\frac{7}{8}$ i.p.s. plays over 12 hours): three independent motors (B.T.H.). Special foolproof interlocking controls. Instant stop without spillage. Pause control. Digital rev. counter. Fast rewind (1,200 ft. in 45 secs.). Mk.5 Deck with provision for extra heads. **28 Gns.**

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Or with two micro-
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A preliminary announcement

BRITISH AMATEUR TAPE RECORDING CONTEST 1960

THE fourth annual British Amateur Tape Recording Contest, now being arranged, will be the biggest event of its kind in the world. Every year since it was first established by this magazine it has attracted wider interest. Its unique link with the International Contest which has taken place on the Continent every year since 1952 enables entrants to compete against other enthusiasts throughout the world for a spectacular list of prizes.

The 1960 Contest will be divided into a number of sections.

The main Contest will be sub-divided into six categories.

1. Compositions — Radio plays, dramas, sketches, etc., not exceeding 15 minutes.

2. Documentaries and "reportage" —not exceeding 10 minutes.

3. Music or Speech—not exceeding 4 minutes.

4. Actuality—unusual voices, historic moments, etc., not exceeding 4 minutes.

5. Technical experiment—not exceeding 4 minutes.

6. Club section—feature tapes of any character on any subject, not exceeding 15 minutes.

7. Schools section—see details on the right.

There will be prizes for the best entries in each category. Details will be announced shortly.

The winning tapes will be automatically sent forward as entries in the International Contest, in which there are further prizes to be won.

Prizes will be presented, and a selection from the best tapes played, at a special function which will be organised in London at the time of the 1960 Radio Show.

Closing date for the Contest is earlier this year than in earlier contests, as the growing number of entries make it necessary to give the judges more time. Last date for receipt of tapes will therefore be Friday, July 1.

The Contest will again be organised with the support of all the most important tape recording interests in Britain. The Federation of British Tape Recording Clubs will be closely associated with the event.

It is hoped that the winning tapes will again be broadcast by the B.B.C., as they were last year.

A number of leading firms are co-operating closely. The best entry overall will be selected as "The Tape of the Year" and will again be awarded the handsome Emitape Challenge Cup.

The Wyndor Gold Medal will be awarded for the best technical production.

And many other firms have shown interest in offering prizes.

Entry forms are not yet ready. Further information will be published shortly.



THE SCHOOLS CONTEST

THE Schools Contest was organised separately last year for the first time. Though it did not attract a large entry, the standard was remarkably high. The British entry in the schools section of the International Contest was finally judged to be the best tape in the whole Contest.

In this way, the British Schools Contest has attracted very wide interest.

To enable many more schools to take part this year, certain important changes are being made.

The type of elaborate feature tape asked for in previous Contests will not be appropriate in this year's event.

There is nothing to stop those enthusiasts who want to make such tapes, with the participation of schoolchildren. The results can then be entered in the general Contest, in the appropriate category.

But the Schools Contest will henceforth be a contest for schoolchildren.

Participation will not interfere with normal school work; it will, in fact, en-

courage the work done with tape recorders in schools.

It will play an important part in assisting those teachers who are responsible for speech training, for choral work, for instrumental work, or for percussion groups. All age groups will be catered for.

Schools are invited to submit a tape, not exceeding 15 minutes duration, in the form of a school magazine in sound.

It will be made up of a number of items representing the varied activities of school life. A number of children—or even classes—will thus have the chance to participate.

The various items can then be linked with continuity and so welded into a composite impression of school life.

For the outstanding entry overall, there will be the handsome Grundig Challenge Cup, illustrated above.

Closing date will be Friday, July 1. Fuller details will be published shortly.



Scottish schoolchildren making good use of a tape recorder



The Emitape Cup for the Tape of the Year

PREMIER AWARDS IN THE CONTEST



Wyndor Gold Medal for the best technical performance

presenting the
PRINCESS

* * * * *



Another Elizabethan triumph—the new Princess—the most outstanding recorder of the present day. Three speeds and true-to-life reproduction. Four hours' playing. Most versatile features including mixing, super-imposition and listening while recording. Attractive two-tone cabinet, small and light. Simple push-button controls. Altogether, top for performance, top for looks, and TOP for value at its remarkably low price.

To be top of the poll—present the Princess.

39 gns

**Ready to use,
 Complete with microphone,
 tape, etc.**

Elizabethan

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 Romford, Essex

Name

Address

BLOCK LETTERS PLEASE

By **B. E. WILKINSON**

MAKING FULL USE OF THE POSITION INDICATOR

MOST tape recorders are fitted with footage indicators and, while these are extremely useful for identifying required positions on a tape, they do not give direct and accurate indication of the length of tape used, or the amount available.

The reason for this is simple.

Let us imagine that one revolution of the supply spool is indicated by an increase of one on the footage indicator. A seven inch spool full of tape will give up $(2\pi \times 3.5) = 7\pi$ inches of tape during the first revolution.

When the spool is nearly empty, a single revolution, while still producing a reading of one on the indicator, will only result in about $(2\pi \times 1) = 2\pi$ inches of tape being passed to the take-up spool. The footage indicator, therefore, gives directly, the number of revolutions made by the supply spool, but the amount of tape represented by that figure is more complex to obtain, since the rate at which the tape is taken off per revolution varies.

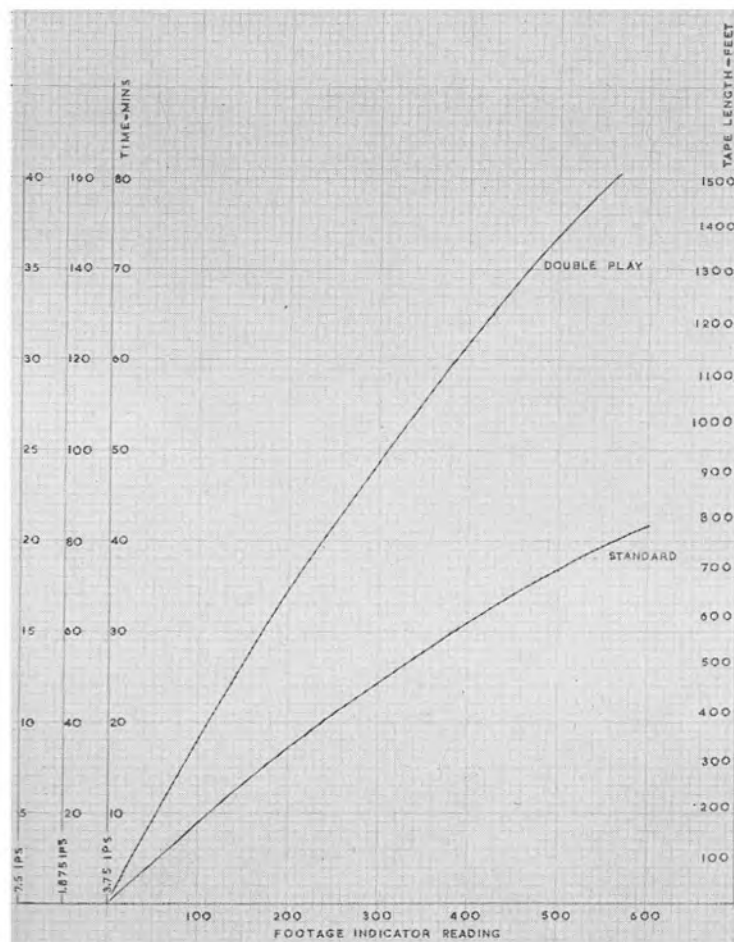
It is, however, very useful to know how much tape has been used, and hence how much is available, and this can be obtained from a chart, which can be made for any recorder using a footage indicator.

It should be pointed out, however, that, due to the gearing differences in the drives to the footage indicator, such a chart can only be used with the recorder from which it was calculated. The graph shown, for example, was worked out for my own recorder, and would be inaccurate for any other model.

Taking a piece of graph paper, one should first construct the axes shown. The horizontal axis represents the footage indicator reading, which normally covers a range of 000 to 999. In the graph shown, it is only taken to 600. This is because it was found that for normal playing, the reading rarely exceeded this figure.

The scale must accommodate the size of spool which will normally be used. The left hand vertical axis represents playing time in minutes, the three scales being for 3.75, 1.875 and 7.5 inches per second respectively. The relation between these scales will, of course, be the same for any recorder, though only the speeds of the recorder itself should be included.

How far the time scale should extend



depends on the longest playing time of which the recorder is capable, using a standard spool of tape.

The right hand vertical scale gives the length of tape, and is easily constructed from the left hand scale.

Length of tape = tape speed \times time :
Length of tape :

\therefore time = $\frac{\text{tape speed}}{\text{Length of tape}}$
considering 600 feet, at 3.75 inches per second,

time = $\frac{600 \times 12}{3.75 \times 60} = 32$ minutes.

Thus 600 on the length scale is placed opposite 32 on the 3.75 inches per second scale.

The $\frac{12}{60}$ term in the calculation is necessary to bring inches per second to feet per minute.

The axes completed, it is now necessary to obtain data for the plotting of the actual curve. The recorder should be loaded with a spool of standard tape, and laced up ready for running. The footage indicator must be set to zero.

Using a stop watch or an accurate wrist-watch, time should be noted for indicator readings of 0, 100, 200, etc. It is well to repeat the procedure to ensure accuracy.

We now have a set of readings of time against footage indicator. These should be plotted carefully on the chart pre-

pared, and the curve will appear to fall away from the vertical.

This curve represents standard play tape only. For representation of double play tape, it is only necessary to double the time for each footage reading taken, and replot. This will give the second curve as shown.

To construct one for long play tape, it will be necessary to multiply the time by $3/2$, since a length of long play tape will play for $3/2$ times as long as the same length of standard tape.

The chart is very simple to use. Considering the chart shown, suppose the recorder was stopped at a footage reading of 350. A line produced vertically, from this point, cuts the curve. Looking horizontally from the intersection, we see a tape length of about 520 feet. On the left hand scale this is equivalent to about $27\frac{1}{2}$ minutes of playing.

Now the curve was worked out on the basis of a $5\frac{1}{2}$ inch spool, which it is known gives a full playing time of approximately 45 minutes with standard tape.

There is thus $(45 - 27\frac{1}{2})$ or $17\frac{1}{2}$ minutes of playing time left.

Finally, it must be said that such a chart has limitations—one already mentioned is that it is only usable with the recorder from which it was calculated. Further, it must be used in conjunction with a supply spool of the same size as the one used when the chart was made.

The New Decks

Fourth article in our regular series

THE Grundig TM20 has been designed for the person who wishes to add the facilities of a first class tape recorder to his existing radio receiver or radiogram. This machine includes a tape deck, recording amplifier, HF oscillator, playback pre-amplifier, and power pack and is, in fact, a complete recorder, except for the loudspeaker, playback power amplifier, and cabinet.

It is only necessary to connect the playback output plug into the pick-up sockets of the radio receiver, and the

THE GRUNDIG TM20

mains lead into the AC mains, for the instrument to be ready for use.

Although the TM20 will work with any receiver, the high performance of this machine demands a good-quality

receiver if full justice is to be done to reproduction of tape.

If the TM20 is to be used in conjunction with an AC/DC or other live chassis receiver, great care should be exercised in connecting up, and the advice of the manufacturers or other authority should be sought. These remarks are not confined to the TM20, of course, and apply equally well when any piece of apparatus is being connected to an AC/DC receiver.

To install the unit, it is necessary to cut a hole approximately 12 in. x 8½ in. in the mounting board of the proposed cabinet, fit four wooden mounting blocks, and drop the unit into place, fixing with four screws. Clear instructions, and a template, are supplied to enable any person capable of using a fretsaw to do this job. It is necessary for the owner to make his own wooden blocks, which, although a simple job, may prove a little irritating to the non-practical man; I would suggest that suitable blocks might be included in the kit.

As a practice run, the unit on test was installed in an old (1938 model) HMV radiogram, in place of the turntable and pickup. The whole process was easily completed in an afternoon, and the results obtained were indistinguishable from the performance of the radio itself.

As would be expected, a vast improvement resulted when reproducing tape records, compared with performance of the original gramophone pick-up on disc.

The handsome appearance of the TM20 will allow the instrument to blend well with almost any cabinet finish.

Apart from the combined volume/modulation control, the machine is controlled by one knob and three push buttons.

The knob has five positions for controlling the mechanical section, arranged in the following order: Fast rewind, stop, normal play, pause, fast forward. During replay, this control provides all the mechanical functions and, in conjunction with the digital position indicator, allows any item on the tape to be found almost exactly.

To quote an example, a sound was recorded on the tape, the number on the position indicator being slightly above 91. After completely running the tape through several times backwards and forwards, the sound was reproduced and came up on number 92. This represented an error of only 5 seconds.

Sound Effects

Alan Edward Beeby, who has had years of experience in this field, continues his regular column of advice and ideas.

IT is sometimes necessary in sound effect composition to make the sound appear as though it was recorded in a dungeon, a cave or in a large empty room. In other words, it has to have an echoing quality, and the easiest way to achieve this is by using a recorder which has two speeds.

Note, however, that this method is only suitable for *sounds*, as distinct from the human voice. In cases where an echo is to be added to speech you must either make your recordings in surroundings that give a natural echo or use a machine which incorporates a "signal-repeat" arrangement in the recording-stage.

A prison scene will serve as an illustration of our requirements in the echo department, the two main sounds called for in this case being footsteps and the sliding and slamming of heavy iron doors. Both these sounds, with accompanying echo, can be obtained by constructing the following piece of equipment.

Take a large, empty wooden box, say 3 ft. x 2 ft., and fit a groove-track along the top and bottom on the open side. Into this, a sheet of thick glass is fitted which is half the width of the opening itself. This allows the glass to slide backwards and forwards.

First of all, set the machine to record at *double* the speed of that intended for play-back. This means, of course, that

the tempo of your actions in operating the effect must also be double the normal speed. While, perhaps, it is not so important in the "sliding door" item, any unnatural slowness in the "footsteps" effect would clearly be noticed on play-back.

For the "sliding door" effect, simply push the glass from one side of the box to the other fairly quickly so that it meets the end of the box with some force.

Now switch back to normal speed and play it back. The result should be a heavy grating sound ending with a loud "Boom!", followed by a reverberative fade-out. This is due to the fact that the original sound has been stretched to twice its normal length by occupying twice the amount of tape.

The echoing footsteps are done in the same way of operation, the first two fingers being drummed against the side of the box.

By the way, if you find that the "heavy" quality seems to be lacking, try putting the microphone *inside* the box, with the lead taken through a hole in the side so as not to hinder the passage of the glass.

One final point. Don't attempt an effect of this kind in a room containing a thick carpet, soft furnishings and heavy curtains. If you do, the result will simply be one of distortion, without any echo at all.

Take your recorder into the kitchen, or even down into the cellar if possible! Always operate your effects in conditions which are as close as can be obtained to those which you are trying to imitate.

Don't expect the tape recorder to do *all* the work!

**By CHARLES
LANGTON**

A.M.Brit.I.R.E., A.M.Inst.E.

There are three inputs to this recorder : microphone, pick-up, and diode. Each may be selected by pushing the appropriate button, an interlocking system being incorporated to prevent pressing accidentally. Furthermore, all or any combination of the buttons may be pressed to give mixing effects, although some loss in volume and quality does occur, owing to the input impedances being paralleled.

The frequency response of this machine at its single speed of $3\frac{1}{2}$ ips is quoted as 60 cps to 10,000 cps at minus four dB and plus five dB respectively, related to zero dB at 1,000 cps.

Measurements carried out according to the instruction manual gave the following figures:—

60 cps, minus 3 dB
333 cps, minus 1 dB
1,000 cps, zero dB
8,000 cps, plus 0.5 dB
10,000 cps, plus 4 dB

A split phase induction motor using an outer rotating cage is employed, and, in conjunction with a substantial flywheel, maintains a constant speed with no sign of overheating. No audible wow or flutter was present. The playing time for each track of the $5\frac{1}{2}$ in. LP tape supplied is just over one hour, while fast wind in either direction took $3\frac{1}{4}$ minutes.

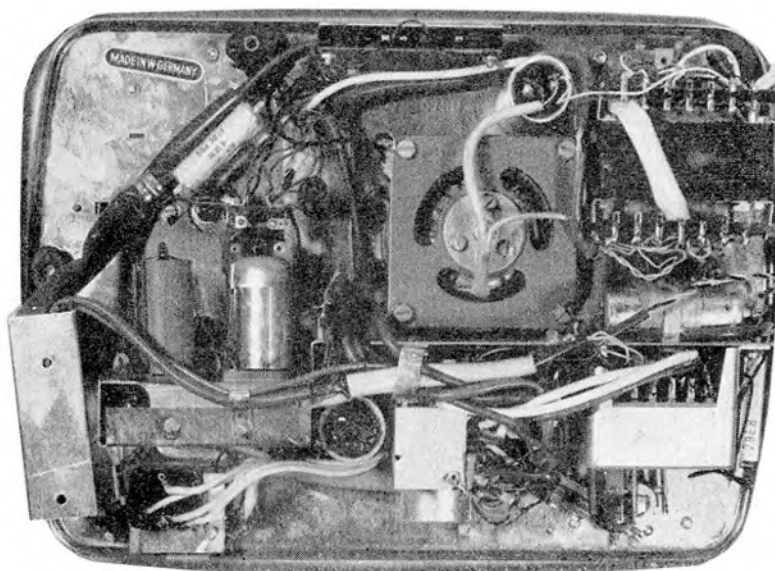
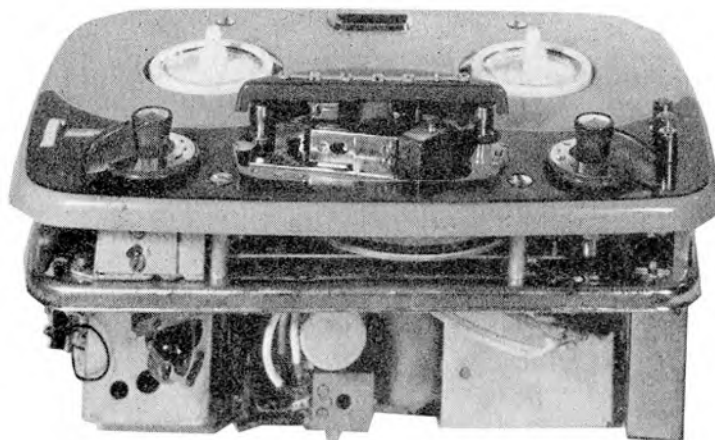
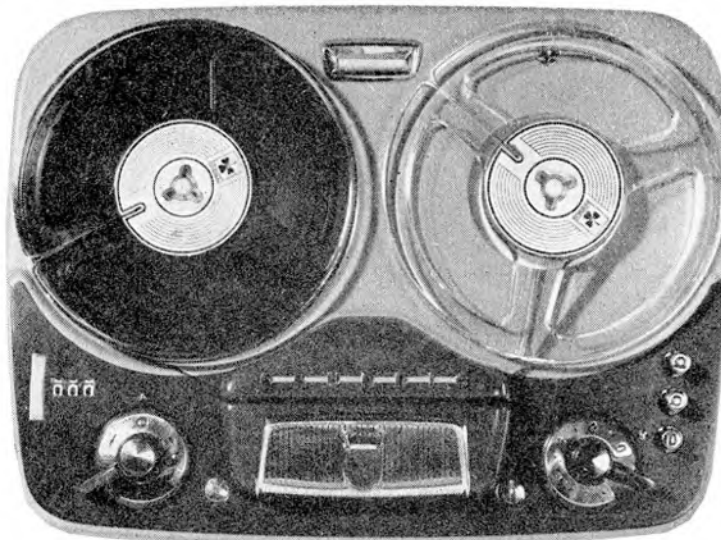
The HF oscillator produced an almost pure waveform at a frequency slightly below 80,000 cps, a feature which contributed towards the low distortion produced when recording. Erasure was complete, with no overheating of the ferrite erase head.

I have always tended to criticise metal control knobs or push buttons that are electrically connected to chassis, and I was pleased to note that the metallic push buttons fitted to the TM20 are completely insulated from the chassis and from each other.

An important feature of any tape recorder is the manufacturer's ability to offer adequate servicing facilities, in co-operation with the retailer. In this respect, Grundig produce service manuals and data which can hardly be improved upon and seldom equalled.

Finally, a listening test was carried out in conjunction with a high-quality power amplifier and loudspeaker system, recordings being taken via an FM receiver. The results were superb, whilst the mechanical operation of the controls gave smooth transition from one function to another, and the reels could be brought to a rapid stop without tape spill. The usual Grundig automatic stop feature worked perfectly at normal tape speed, but not at the end of a fast rewind.

The Grundig TM20 can be confidently recommended to all interested in converting to tape.



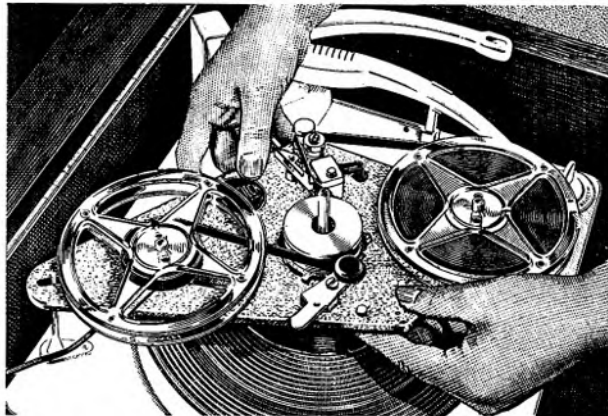
Three views of the Grundig TM20 deck. Top—a bird's-eye impression, which shows the handsome lines of the deck. Centre—front view, with the head cover removed. Bottom—the underside, showing electronic components

Photographs by Brian Worth

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- DP4/M—600 ohms—70 dB below 1 volt/dyne/cm²
- DP4/H—50,000 ohms—52 dB below 1 volt/dyne/cm²

Retail price DP4/L/pack 1:—low impedance Microphone, complete with connector, 18ft. screened lead, swivel holder and circular base. £8 19. 6d. (Extra for H or M impedance models—£1. 0. 0.)

MATCHING UNIT G.7

For use in cases where it is desired to use a low impedance microphone with a recorder or amplifier having a high impedance input. It can also be used in cases where very long microphone leads are necessary. Retail Price £3. 5. 0.



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Advice Bureau

In each issue we shall reprint one specimen question and answer dealt with by our Advice Bureau. Others will be dealt with by post. When sending queries use the coupon below.

Q. I use an Acos stick microphone with my recorder, and in order to record brass bands I wish to extend the microphone lead considerably. I have tried using a 100-1 microphone transformer at each end of the longer lead, but only get hum.

Is there any way of overcoming this, either with my microphone or one of different impedance, and if so, what do you suggest? (H.M., Southend-on-Sea.)

A. To enable you to use long microphone leads, it will be necessary for you to change to a different microphone of 30/50 ohms. There are two types of microphone with this impedance, a ribbon is most suitable for indoor recordings and a moving coil when recording outside.

The microphones are obtainable from any of the following: Film Industries Ltd., Lustraphone Ltd., Reslosound Ltd., Simon Sound Service Ltd., Standard Telephones Ltd., and Trix Electrical Co. Ltd.

Only one transformer would be needed if either of these instruments were used, and this should be placed at the recorder end of the long lead. The transformer should have a centre-tapped primary, and the leads would need to be of the twin-screened variety.

TAPE RECORDING AND HI-FI
MAGAZINE ADVICE BUREAU
JANUARY 13th, 1960

EDWARD GREENFIELD, recorded music critic of The Guardian



Philharmonic Pops

—a lively new tape record

UNDERSTANDABLY, demonstration stereo tapes of short and preferably brilliant pieces are particularly popular. Recently E.M.I. gave us a superb selection of Viennese pieces with Kempe and the Vienna Philharmonic Orchestra, and now comes a selection called "Philharmonic Pops" (SCT 1525) with the Sinfonia of London conducted by Robert Irving. It would be idle to pretend that Irving secures the same sort of warm, vivid playing of the waltzes here—a selection from "The Merry Widow" and Waldteufel's "Skaters" Waltz—as Kempe did with Viennese players who were probably born waltzing.

But once that is said this is an extremely lively and enjoyable recital. I was particularly delighted with the arrangement of the "Flight of the Bumble Bee" (a piece which one completely forgets Rimsky-Korsakov wrote for an opera, "Tsar Saltan"). Perhaps it was Harry James with his unbelievable trumpet arrangement who first taught us to be tolerant of the piece being used simply as a technical demonstration.

Whatever the musical considerations it was certainly a brilliant inspiration in the performance on this tape to use a harpsi-

chord of all things for the solo part against the orchestra. I am not sure what Rimsky-Korsakov would have said, but as he himself was an inveterate arranger of other people's music he would have appreciated the cleverness of the feat and certainly the agility of George Malcolm's playing.

Another extraordinary arrangement on the tape is of Kreisler's light-hearted violin encore "Tambourin Chinois." As it happened I heard it before I looked closely at the label and for a full minute I was completely at a loss to identify this music which though so extremely well-known to me was decked in completely new clothes. Whatever one's objections in theory Douglas Gamley's arrangement with its vivid use of vibraphone and xylophone certainly comes off in practice. And after all a piece called Chinese Tambourine can legitimately be given plenty of colour.

Gamley has also arranged a number of the other pieces on the tape and I liked particularly the arrangement of Liszt's Etude de Concert No. 3 in D flat major in which the young American pianist Abbey Simon provides another star solo item.

Perhaps in such a deliberately popular selection it is churlish to criticise the soupy accounts of the Londonderry Air and the famous Air from Bach's Suite No. 3 (on the G string only in the violin solo arrangement and not here). Unfortunately while the souppiness comes out Irving does not really convey much warmth in the interpretation. Generally it is the fast and brilliant pieces like the Polonaise from Tchaikovsky's "Eugene Onegin," the "Flight of the Bumble Bee" and Brahms' first Hungarian Dance that are the most successful.

It is rarely that I have to fault an E.M.I. tape on technical grounds, but I was disturbed on this one at the pitch variation that disturbs the Bach Air. Strings can usually stand some pitch variation in reproduction without anyone worrying, but this (possibly a fault on my individual copy) is rather beyond my tolerance limit, though I know my ears are particularly exacting on this. There is also a hint of pitch variation in one or two woodwind passages in the "Merry Widow" waltzes.

For the rest the recording is very warm and atmospheric without showing quite the inner clarity that E.M.I.'s best tapes have. A very agreeable balanced noise nonetheless. This tape is, incidentally, in E.M.I.'s cheaper SCT category, and provides particularly good playing time for money.

HOW ONE TOWN USES TAPE

On deck — in church — at the dance

WHEN the Greenock Boys' Pipe Band was entertained to lunch on board the Royal Canadian destroyer, *Algonquin*, recently, it played selections for the assembled ship's company. Then the boys were shown round the ship—to the accompaniment of their own music, played over the loudspeakers!

A tape recording had been taken of all their pipe selections.

It is being retained by the ship to remind officers and ratings of their happy stay in Greenock.

Tape has recently been playing a big part in the civic and social activities of Greenock.

When the submarine *HMS Walrus*, was launched from Messrs. Scott's shipyard, tape recordings were taken of the speeches of all four guests—the Duchess of Gloucester, the Earl of Selkirk, Mr. M. A. Sinclair Scott and Mr. George Hilton.

At a reception given to welcome their

new minister, the Rev. Andrew S. Taylor, in Greenock's Union Church, tape recordings were taken of the whole proceedings.

Mr. Taylor and his wife are keeping a copy of the recording as a souvenir.

At the annual Remembrance Day dinner of the Greenock Branch of the British Legion, a tape recording was taken of all the speeches.

A copy is being sent to a former official, Mr. Robert Carr, who is now in Tasmania.

Wedding couples have also sent tape recordings overseas from Greenock. Miss Myra Allan, of Greenock, sent a recording of her ceremony and reception to her married sister in New Zealand. Another Greenock couple sent a recording to the bride's grandmother in Australia.

A stereophonic high-fidelity unit has replaced the band for dancing at the Port Glasgow AAC club premises.

MOTEK

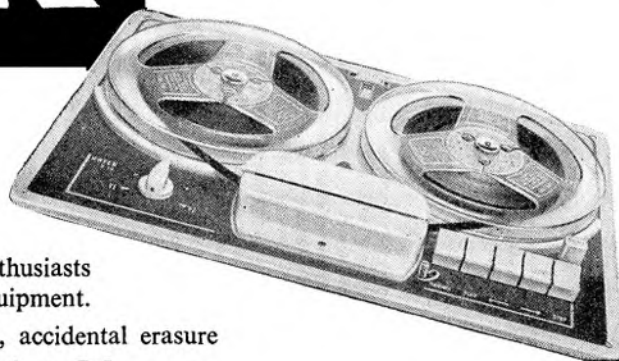
Patents Pending. Details of K10
(as illustrated) on Request.

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The New Models

So many new tape recorders have been introduced this season that it has been impossible to describe them all fully when they first appeared. In this regular feature, we shall provide photographs and full specifications of models which have recently made their bow.



SAGATONE 3S29

The second of the three new Saga recorders with a wide range of facilities

Manufacturer's Specifications

Price: 29 guineas. Deck: B.S.R. Monardeck.
Speed: $3\frac{1}{2}$ ips. Rewind Speed: Three minutes.
Frequency response: 60—10,000 cps \pm 3dB.
Wow and flutter: Better than .4 per cent.
Output: $3\frac{1}{2}$ watts. Weight: 19 lb.
Size: $15\frac{1}{2} \times 13 \times 9\frac{1}{2}$ in. Max. spool size: $5\frac{1}{2}$ in.
Speaker: 7×4 in. elliptical. Mic.: crystal, Acos 40.
Other facilities: Superimposition, monitoring, mixing, safety erase lock, magic eye recording level indicator, tone control, input sockets for microphone, radio/gram, extension speaker socket, can be used as straight-through amplifier.
SAGA RECORDS LTD., 538-540, HOLLOWAY ROAD, LONDON, N.7.

REGENTONE RT 51

The first of two new Regentone models. The specifications of this machine speak for themselves

Manufacturer's Specifications

Price: 49 guineas. Deck: Motek.
Speeds: $1\frac{1}{2}$, $3\frac{1}{2}$, $7\frac{1}{2}$ ips. Rewind speed: 80 seconds.
Frequency response: 50—14,000 cps.
Wow and flutter: Better than .04 per cent.
Output: 3 watts. Weight: 24 lb.
Size: $17 \times 14 \times 7\frac{1}{2}$ in. Max. spool size: 7 in.
Speaker: 7×4 in. elliptical.
Microphone: crystal, Acos 40.

Other facilities: Mixing, safety erase lock, twin-neon recording level indicator, pause control, separate bass/treble control, digital counter, input sockets for microphone, radio/gram, extension speaker socket, can be used as straight-through amplifier, printed circuit.

REGENTONE RADIO & TELEVISION LTD., EASTERN AVENUE WEST, ROMFORD, ESSEX.



REGENTONE RT 20

Using the B.S.R. Monardeck, this recorder has a performance equalled by ease of operation

Manufacturer's Specifications

Price: 29 guineas. Deck: B.S.R. Monardeck.
Speed: $3\frac{1}{2}$ ips. Rewind Speed: Three minutes.
Frequency response: 50—8,000 cps.
Wow and flutter: Better than .4 per cent.
Output: 1.8 watts. Weight: 14 lb.
Size: $14\frac{1}{2} \times 13 \times 7$ in. Max. spool size: $5\frac{1}{2}$ in.
Speaker: 7×4 in. elliptical.
Microphone: crystal, Acos 40.

Other facilities: Monitoring, mixing, safety erase lock, twin-neon recording level indicator, tone control, output for extension speaker, input sockets for microphone, radio/gram, can be used as a straight-through amplifier.

REGENTONE RADIO & TELEVISION LTD., EASTERN AVENUE WEST, ROMFORD, ESSEX.



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- ★ 8 Hours Playing
- Mono at 3 3/4" on 7" Reel



Elektron 95/4K

From TSL come today's most advanced Continental tape recorders, each with its own special features to give you choice from a range that will be modern for years to come. With any of the three, live stereo recording becomes as practical and as simple as single-channel operation, and you don't need an add-on unit to do it. Used monaurally, you make a fabulous saving in tape costs for each reel gives twice or four times what is obtainable

HARTING HM8

4-track, 2-speed recorder (7 1/2 and 3 3/4 i.p.s.) with two speakers (one in lid) for direct stereo replay. Overall response 30-20,000 c/s ±3dB. Heavy Engel Motor, Telefunken heads; pause, super-impose and monitor facilities, etc.

86GNS

ELEKTRON 95/4K

4-track, single-speed recorder (3 3/4 i.p.s.) in small compact "airline" styled case, 2 15-ohm outlets; built-in speaker. Pause, superimpose, monitor facilities, etc., etc. Response 30-16,000 c/s ±3dB. Squirrel-cage motor by Papst.

77GNS

KÖRTING MK. 128 (Illustrated)

4-track, single-speed recorder (3 3/4 i.p.s.). Telefunken heads, built-in speaker for monitoring. Response 30-16,000 c/s ±3dB. 5 watts total output. Superimpose, pause, etc., etc. Heavy-duty AEG motor. 7-in. reels.

68GNS

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 - £1 deposit and 51 weekly payments of 12/8 will bring you the NEW PHILIPS EL 3515 with mike. Cash 32gns.
 - £1 deposit and 59 weekly payments of £1 will bring you TELEFUNKEN KL 75/15 with microphone. Cash 57gns.
 - £1 deposit and 54 weekly payments of £1 will bring you GRUNDIG TK20. Cash 52gns.
 - 30s. deposit and 49 weekly payments of £1 will bring you WYNDSOR "Viscount," SPECTO 161 or R.G.D. 103. Cash 49gns. each.
 - £1 deposit and 19 weekly payments of 10s. will bring you CADENZA RIBBON MICROPHONE. Cash 10gns.
 - £1 deposit and 14 weekly payments of 10s. will bring you WAL Bulk Tape Eraser. Cash £7.19.6.
 - £1 deposit and 59 weekly payments of £1 will bring you the NEW PHILIPS EL 3538 with mic mike. A much improved model at the lower price of 57 gns.
 - £1 deposit and 60 weekly payments of £1 will bring you VERITONE "Venus" with microphone. Cash 58 gns.
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V.I.Ps PEOPLE IN THE NEWS

Mr. G. S. Taylor has been appointed chairman and managing director of Grundig (Great Britain) Ltd., to succeed Mr. A. E. Johnson, whose death was reported in our last issue.

Mr. Taylor has been Grundig's commercial director and has been with the firm since it was founded seven years ago.



Mr. G. S. TAYLOR

(see story)

He is a man with his roots deep in the Radio Industry. He first came into the trade in 1923 and has held a succession of important appointments with well-known manufacturers in this field. In 1950 he developed an interest in tape recording which he was able to put to practical use when in 1952 he assisted in establishing Grundig in Great Britain. In setting up a sales organisation, he was the first person to propagate tape recorder sales mainly through the radio trade, and many friends and contacts he had gave an immediately efficient and enthusiastic system of distribution.

Mr. Taylor has also been appointed a Director of Gas Purification & Chemical Co. Ltd., and he is Managing Director of

TAPE TITTER



Wolsey Electronics Ltd. and a Director of other companies in the Gas Purification Group.

MAGAZINE DIGEST

A new Tape Recording service

Readers of this magazine are assured of the most comprehensive and up-to-date coverage of the whole world of tape recording and hi-fi.

There are, however, a host of similar publications now on sale and, naturally, they will contain particular items that may be of interest to our readers.

In order that readers may know when there is an item which will make it worth

their while obtaining other publications, we shall publish a regular digest of the principal articles on tape recording published elsewhere.

Hi-Fi Tape Recording (America): "201"—a description of the making of a stereo tape record; "The tape broke"—an article on splicing technique.

Revue du Son (France): "Pour une classification des appareils à enregistrement magnétique"—a standard catalogue of recorders available in France.

Journal of the British Sound Recording Association: "Acoustic Factors in Sound Reproduction"; "Transistors in low-noise pre-amplifiers."

The Tape Recorder: "Techniques in Editing," by I. W. Jarman; "Recording for beginners—improving the quality."

Hi-Fi Review (America): "Satellites for Stereo," a new principle of sound projection using four speakers.

Amateur Tape Recording (January): "The Theatre Organ on Tape," by Stanley White; "What is a Mixer Pre-amplifier?"

In every case the issue described is the December one, unless otherwise stated.

TAPE RECORDING HANDBOOKS
HI-FI FOR THE MUSIC LOVER
By Edward Greenfield
3/- (3/6 inc. postage)

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turers for information about
new products, please mention
that you "saw it in Tape Re-
cording and Hi-Fi Magazine"

WHEN more than one input source is employed, e.g., two or more microphones, some form of control is necessary to enable the operator to change from one to the other or to mix the input sources into a common amplifier.

A properly designed mixer or fader system should enable this to be achieved smoothly and without noise.

Mixers, as the complete system will be called, may be divided into high impedance and low impedance, constant impedance and non-constant impedance. To achieve correct functioning of mixers it is necessary to provide for the control of the level of each individual input source and provide some indication of the level at the output socket.

NON-CONSTANT IMPEDANCE MIXERS

These are commonly used in public address amplifier systems and other applications which do not require precise adjustment to a pre-determined level. The controls are of the continuously variable potentiometer type and mixing is usually carried out between a pre-amplifier and a subsequent amplifying stage; under these conditions it is not necessary to maintain either constant input or output impedance.

In some cases, the mixing is carried out between the input sources and the first valve of the amplifier, although here the load impedance presented to each source must be maintained constant. This type of mixer generally consists of three or more potentiometers and is quite unsuitable for mixing high impedance microphones. In any case, the potentiometers will give rise to noise after some use.

The simplest type of "fader", which does not provide mixing, is shown in Fig. 1 and is only suitable for high level pick-ups, since noise from the moving contact may be appreciable after some use.

Fig. 2 shows a series network mixer, but again the circuit has drawbacks, since it will give rise to hum and noise if used

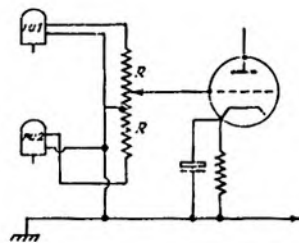


Fig. 1.—A simple fader for two pick-ups
 $2R$ = total resistance
 R = resistance recommended for each pick-up

Another learn- as-you-make-it article by

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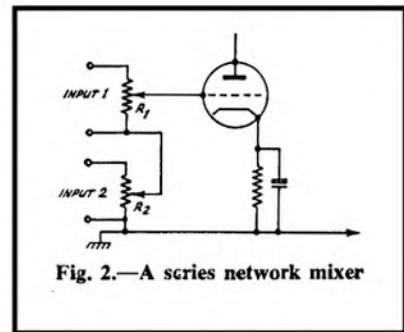


Fig. 2.—A series network mixer

in front of a high gain recording amplifier.

A parallel network mixer is shown in Fig. 3, where three input sources are provided, although any greater number may be used. The value of R_4 may be made equal to or greater than R_1 and similarly with other channels.

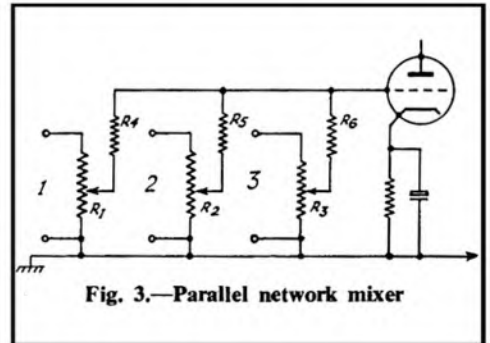


Fig. 3.—Parallel network mixer

This type of mixer should only be used between amplifiers and is again unsuitable for high impedance microphones. Used in front of a high gain amplifier it will be likely to generate noise from the sliders. If the mixer is connected between amplifiers, i.e., has a pre-amplifier between the input source and the mixer circuit, all resistances should be equal (say 0.5M.ohms). The maximum insertion loss will then be 6 dB for two channels, 9.5 dB for three channels, or 12 dB for four channels. The insertion loss varies when the controls are normal, the maximum variation being about 2.5 dB for each potentiometer per two channels, but less per potentiometer for more than two channels.

VALVE MIXERS

Probably the most popular of all mixing circuits in this class is the method of using a common anode load for two or more valves. When two valves are used in this type of circuit, the anode

A GOOD TAPE RECORDER DESERVES A GOOD MIXER

resistor of each valve acts as a shunt load on the other, thereby reducing the gain and the output voltage for a limited distortion. With triodes the gain is equal to the normal gain for a single valve multiplied by $(r_a + R_L)(r_a + 2R_L)$.

If R_L is considerably greater than r_a the gain is slightly greater than half that for a normal valve. With pentodes the loss of gain due to shunting is slight and may be neglected in most calculations.

The effect of the shunting on the maximum output voltage is much more severe than on the gain. The output voltage for limited distortion is approximately equal to the normal output voltage multiplied by $r_a(r_a + R_L)$. If $R_L = 5r_a$, as for a typical triode, then the output voltage is reduced to one fifth of its normal value. For this reason it is suggested that $R_L = 2r_a$ would be more suitable, giving a reduction to one third of the normal value. Here again the effect on pentode valves is very small.

There are many other types of mixer circuits, and one must be mentioned for the sake of interest and completeness. This is the "Constant Impedance" type widely used in studio equipment. Constant impedance attenuators are used and in such equipment usually work "out of" and "into" 600 ohms.

The constant impedance attenuators may be of the "T", "bridged T", "Pi", "Ladder" or other forms, together with their balanced equivalents. They may be arranged in parallel, series, series parallel, or bridge circuits. Fig. 4 shows a three-channel mixer using "T" type attenuation in parallel. The same principle may be applied for any number of channels.

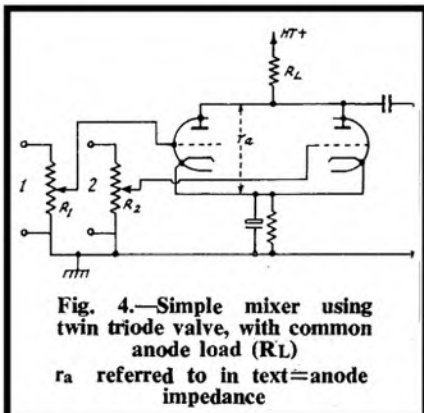


Fig. 4.—Simple mixer using twin triode valve, with common anode load (R_L)
 r_a referred to in text=anode impedance

Many tape enthusiasts have now learnt the value of mixing facilities. An increasing number of machines offer built-in two-channel mixing facilities, and there are several simple and cheap three-channel mixers available for those who have older recorders. This series will describe how to build something much more ambitious, which will give you full professional standards.

DESIGN FOR A MIXER

One of the problems with mixers of the common anode load type using triode valves is the control of volume without introducing hum, noise and circuit complications. This problem may be overcome by using low noise pentodes, such as the EF86. Negative feedback volume control systems and the use of negative feedback over the amplifier chain also helps very considerably in keeping down hum and noise and, at the same time, allows a greatly improved frequency response.

For operation with the modern tape recorder a mixer should have at least two microphone channels and a third for a radio or pick-up input. The third channel may also be used to take the output from a second mixer, thereby providing a system, adaptable for multiple channel mixing.

The circuit to be described is capable of the requirements outlined in the previous paragraphs, will handle three (four with modification) inputs, and supply a mixed output suitable for driving a single input amplifier at high level, such as the radio or pick-up input on a tape recorder.

Two of the channels are suitable for high impedance microphones of the

crystal type and the third for equalised tape, radio or pick-up inputs, etc.

The output voltage may be varied between 40 and 800mV, to suit the input requirements of the tape recorder and the mixer may be adjusted to have a small gain of its own of approximately 2 to 3 dB. It may be constructed with its own power supply or may be adapted to work from an external HT and LT supply socket, as fitted to many tape recorders.

Both microphone input stages are identical, using Mullard EF86 low noise pentodes, operated with grid current bias obtained by means of R_1 , the high value grid resistor. The internal impedance of a crystal microphone is predominantly capacitive, with a capacitance of the order of 2000pfd. and, to avoid loss of terminal voltage at low audio frequencies, the microphone should be connected to a high impedance input stage. If, for example, a resistance of 1.5M.ohms was used for R_1 , a loss of about one-third of the microphone output voltage of 100 cps would occur. A value of 10M.ohms for R_1 has been chosen to prevent this loss of voltage at low frequencies.

Low impedance microphones may be used by having a suitable step-up transformer directly in the grid circuit of either EF86 amplifier, in which case R_1 is omitted.

The specification for the mixer is as follows:—

Output Voltage: 40 to 800mV (adjustable with modification).

Sensitivity: Microphone input 3mV High Level (Pick-up, Radio, etc.) 250mV.

Frequency Response: Flat within ± 3 dB 20 cps to 20,000 cps relative to 1,000 cps.

Hum and Noise Level: 50 dB below full output.

Gain Through Mixer: +2 to 3 dB (adjustable with modification).

Power supply External: 6.3v A.C. (Heaters +250v DC (HT)).

Full details on constructing this mixer and the circuit will be given in Part 2.

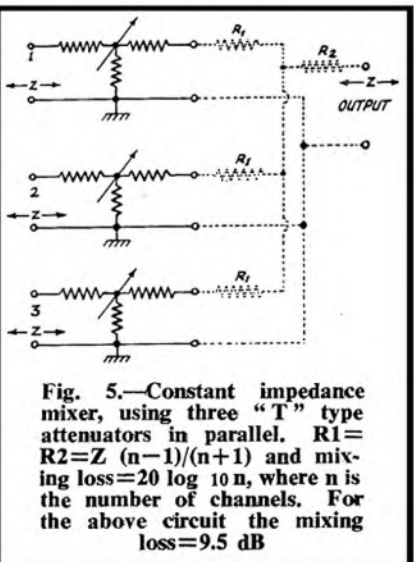


Fig. 5.—Constant impedance mixer, using three "T" type attenuators in parallel. $R_1 = R_2 = Z(n-1)/(n+1)$ and mixing loss = $20 \log_{10} n$, where n is the number of channels. For the above circuit the mixing loss = 9.5 dB

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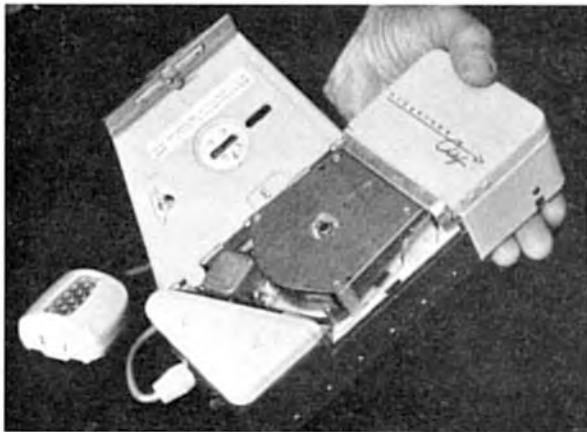
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The Mohawk
Midgetape 400

New Products

TRANSISTOR MODEL— WEIGHT UNDER 3 lbs.

EDISON have introduced a new all-transistor pocket tape recorder that weighs less than 3 lbs. and has a playing time of sixty minutes. It is called the Mohawk Midgetape 400. Overall dimensions are 8½ in. x 3½ in. x 1½ in.

It operates from a single mercury battery which has an operating life of between 12 and 18 hours. A long life battery gives at least 50 hours' playing. A life indicator warns about 2 hours before the battery needs replacing.

The Midgetape 400 has a frequency response of 150 to 5,000 cps, wow and flutter is rated at less than 0.7 per cent and the signal to noise ratio is 42 db.

The motor, which has an electro-mechanical governor, operates at 11 to 7 volts D.C. Twin-track ¼-in. Mylar tape is used at 1½ ips, and is contained in a cassette for easy removal. There is an external close-fitting rewind handle designed for rapid operation.

Three controls are provided on the standard machine—two push-button (for on-off and play-record), and a disc volume control which protrudes slightly at one corner.

Playback is normally through the microphone, any type of which, except carbon, can be used up to 2,000 ohms. There are output points for use with earphones or a separate power amplifier. A transistor speaker can easily be fitted into the battery compartment.

The standard microphone accessory gives two features exclusive to the Midgetape. When correctly plugged in, the volume control is automatically set for dictation work. Playback is also automatically controlled.

The microphone is also equipped for remote push button control of the machine.

The standard Midgetape 400 costs £115, complete with microphone and battery. Extras include the amplifier speaker, £14 10s.; telephone microphone, £4 2s. 6d.; tape cartridge, £4 19s. 6d.

Thomas A. Edison Ltd., Victoria House, Southampton Row, London, W.C.1.

Brittape endless tape cassette

SUITABLE for mounting on one of the drive spindles of any flat-topped 7 in. spool tape deck, the Brittape endless tape cassette will convert the recorder to continuous operation. Up to 200 feet of tape can be used lasting a maximum of 22 minutes. The cost is six guineas.

Guy's Calculating Machines Ltd., General Engineering Division, Truro Road, London, N.22.

NEW RECORDER FROM A NEW FIRM

AUDIO AMPLIFIERS, of Harlow, are introducing a new domestic tape recorder, the Crown, which has been designed by an associate company, CQ Audio Ltd., who are already well-known in the high fidelity field.

The amplifier, with an output of 4 watts, can also be used for disc and

radio reproduction, as well as "straight-through" with a microphone.

The machine incorporates a Collaro Studio tape deck, equipped for three speed use. It has record, replay, start, pause, fast forward and reverse wind and stop controls.

There are also a digital counter, magic eye, monitor switch, volume and tone controls, and a superimposition device.

The frequency response is given as 50 to 12,000 cps at 7½ ips ± 3 db. There are two high impedance inputs—for microphone and radiogram—and an output point for external speaker.

A feature of the machine is that equalisation has been accomplished within a feedback loop and does not rely on conductors, which tend to cause instability and pick up hum.

The Crown is housed in a wooden cabinet covered in grey and green leather cloth.

It costs 39 guineas, including microphone and a 7-in. reel of tape.

Audio Amplifiers Ltd., No. 3 Factory, Tye Green, Harlow, Essex.



The Audio Amplifiers' new
"Crown" Recorder

A complete recorder—19gns.

THE NEW CAROL model TR/1 tape recorder, marketed by Contronics Ltd., costs only 19 guineas, complete with crystal microphone and 850 feet of tape. It is the cheapest machine available, and uses a B.S.R. Monardeck.

Tape spools up to 5½-in. diameter can be used, giving a total playing time of 1½ hours using standard tape at the single speed of 3½ ips.

There is a 7 in. x 4 in. internal speaker. The amplifier has a radio/gram input in addition to one for the microphone. There is an external speaker output.

The Carol is mounted in a red and grey case and is suitable for 200-240 volt A.C. mains.

Contronics Ltd., Garth Works, Deepcut Bridge Road, Blackdown, near Aldershot, Hants.

NEW DAYSTROM FACTORY

DAYSTROM LIMITED have recently opened a new factory, 10,000 square feet in area, at Two Mile Bend, Bristol Road, Gloucester. The expansion comes a little more than a year after the first Daystrom kits were marketed in this country.

At present, 22 kits are available here. In America, the parent firm have more than 300 lines, and British production is to be stepped up towards that level.

"The future is with tape"

RADIO dealers who have still not recognised the potentialities of tape recording were given a sharp reminder by one of the leaders of the industry, Mr. Hector Thorne, of Philips Electrical Ltd., in a recent speech.

Tape, he told a gathering of representatives of the industry, is a small business today, but will become as important as radio and TV.

Sound-wise and picture-wise, the future is with tape.

AMERICAN TAPE RECORDS SELL HERE

AMERICAN pre-recorded tapes from the Concertapes and Omegatapes catalogues are now being issued here through Technical Suppliers Ltd., of Hudson House, 63 Goldhawk Road, London, W.12, the sole distributors for Britain and the Commonwealth.

Hundreds of titles are offered in both stereo and monaural and two or four-track arrangements at both 7½ and 3½ ips. The price ranges from £1 15s. to four guineas, depending on the playing time.

CODED LEADS—A WARNING AND AN ASSURANCE

THE Institute of Electrical Engineers recently published a warning that some electrical apparatus of Continental manufacture which is on sale in this country are not colour-coded to British standards.

The I.E.E. statement said: "The attention of vendors and users of imported domestic electrical apparatus, photographic and projection equipment, tape recorders, etc., is urgently directed to the risks which may ensue if the colour coding of the cores of flexible cord with which such apparatus is furnished differs from the established British coding set out in the Institution's Regulations for the Electrical Equipment of Buildings, that is to say:—

Green—earth connection
Red—phase (live) connection
Black—neutral connection

"The risk is most acute if the flexible cord provided with the apparatus has a core coloured red which serves as its earth connection; because if the user, following established British practice, connects this core to the terminal of a British connecting plug which may itself be marked red, and then inserts the plug

into a normal British socket, the result will be that any exposed metal parts of the imported apparatus connected to the red core will be charged at mains voltage, and represent a serious hazard."

The public discussion of this statement drew a quick reaction from Grundig (Great Britain) Ltd. "We should like to confirm that the colour coding of all Grundig machines fitted with three core mains leads conform to the recommendations laid down by the British Standards Institution of Electrical Engineers for the electrical equipment of buildings," a spokesman said. "There never has been any deviation from this, which concerns principally the green coloured conductor which should be connected to an earth point.

"Furthermore, all Grundig instruction books which relate to our tape recorders and other instruments which are fitted with a three core mains lead specify that the green lead of the mains cable should be connected to the earth pin of a three pin mains plug and NEVER to any other pin.

"We hope that this statement will clearly establish Grundig's position in the matter."

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Equipment Under Test

THE GRAMPIAN DP 4 MICROPHONE



THE Grampian DP4 Dynamic microphone is a medium priced general purpose instrument intended for public address, recording, call systems and communication equipment. It has an excellent appearance in the popular "stick" style, weighing under $\frac{1}{2}$ lb., and is well finished in chrome and black enamel. The microphone is provided with 18 ft. of twin screened lead, terminated one end with a suitable connector. Six different "packs" are available, each with the same microphone and lead, but having various different mounting arrangements. The basic price of the microphone, connector and lead is £7 11s.

The pack supplied for review, Pack 1, included a circular base and swivel holder, the latter being of the quick release type so that the microphone can be easily removed from the stand for hand use. The microphone can be supplied in three versions, low impedance, 25 ohms; medium impedance, 600 ohms; and high impedance, 50,000 ohms.

The microphone was measured for frequency response and was found to be within ± 3 dB of the maker's published average response curve, above 1,000 cps. Below this frequency there appeared to be a constant slight loss down to about 100 cps, where the instrument again conformed to the maker's characteristics. This discrepancy below 1,000 cps may have been due to the acoustic conditions under which the test was carried out, but there was undoubtedly a slight loss

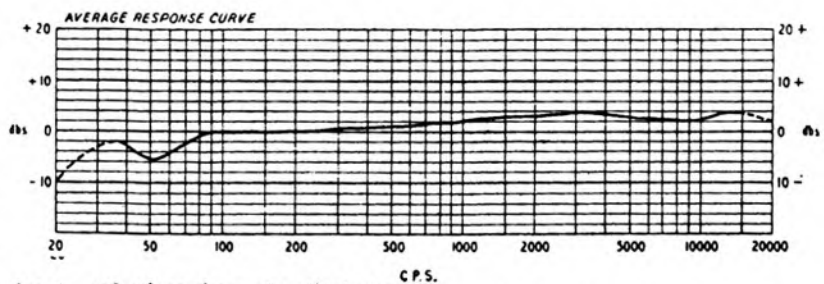
of lower middle frequencies on a listening test under normal working conditions. The maker's published response curve is shown in Fig. 1.

The polar response of the microphone was also tested, and found to be typical of all pressure-operated microphones (Fig. 2).

The microphone is omni-directional at low frequencies, where the dimensions of the microphone capsule are small compared with the wavelength, and there are no reflections from the diaphragm; at frequencies above 1,000 cps the response becomes more and more uni-directional,

The effect is of little consequence in normal close working, but if the microphone is to be used at a distance from the sound source high frequency response may be rather critical as to microphone angle of incidence, and the reverberation picked up will tend to be bassy in character.

Again it must be stressed this is not a fault, but a normal phenomenon of all pressure-type microphones, the DP4



C.P.S.

due to reflections from the diaphragm and phase cancellations across the front of the instrument. This applies, of course, to most moving coil and crystal microphones available for domestic use, and is not confined to the DP4.

Fig. 1: Response curve

being no exception and, indeed, performing very well to theory in this respect.

The output level from the microphone is high, and perfectly adequate to load almost any domestic recorder.

The maker's specification reproduced for those who are interested in technical data is:—

Frequency response: 50 cps to 15,000 cps.

Output levels: DP4/L Low impedance model—25 ohms—86 dB below 1 volt/dyne/cm; DP4/M Medium—600 ohms—70 dB below 1 volt/dyne/cm; DP4/H High—50,000 ohms—52 dB below 1 volt/dyne/cm.

Weight of hand microphone: $7\frac{1}{2}$ ozs.

Length of hand microphone: $8\frac{1}{4}$ in.

Diameter overall: 1 in.

Thread on holder and swivel $\frac{1}{8}$ in. 27

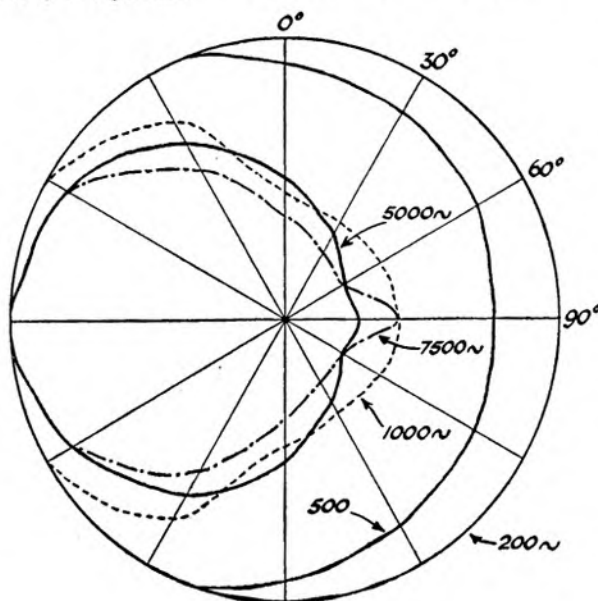
T.P.I. Supplied with adaptor $\frac{1}{8}$ in. B.S.F.

Finish: Black and chrome.

This microphone has been ear-checked on various types of programme material, and I can thoroughly recommend it for tape recording and public address use in those cases where a pressure-type microphone would be indicated by the prevailing acoustic conditions.

H. BURRELL HADDEN

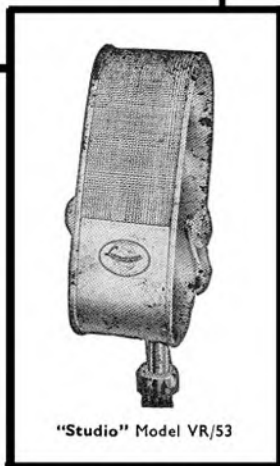
Fig. 2:
Polar
response,
Grampian
DP 4



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News from the Clubs

FULL speed into 1960 seems to be the intention of most of the sixty-odd clubs spread throughout the country. The general impression I have received from club reports is that this year will see an increasing surge towards the creative aspect of tape recording, as distinct from the tape correspondence side. Although, of course, many tape recording enthusiasts are keen to make tape contact with their opposite numbers in various parts of the world, I think that even in this type of contact the creative urge is gaining an upper hand and soon the tapes exchanged will assume professional standards of documentation.

Regular readers of this section will already be aware of the work put in by the members of the Jersey club to produce plays on tape. They have recently started a scheme which will enable a vast audience to enjoy their productions.

Their plan is to form a tape circle among recorder owners and any reader interested in joining is invited to contact Graeme Ahier, of "Santa Barbara," Mautfant, St. Saviour, Jersey, C.I., enclosing details of their recorder. The yearly membership fee of the *Postal Tape Circle* will be ten shillings. For this members will receive each month a sixty-minute sound magazine of plays, short stories and other items of interest. Each tape may be retained for three days, after which it should be passed on to the next member on the list.

Twelve plays are lined up for production at the moment and these will keep members active for some time to come. I am at an advantage on this occasion for my subscription is already on its way to Jersey.

The last meeting of the club, on December 6, was devoted to the Christmas party. During the evening members were entertained to the annual pantomime plus two humorous sketches. They also listened to *Audio-review*, a ninety-minute review of their activities in 1959. The tape, with excerpts from plays produced during the year, will be retained in the club library.

A club whose members have been having a hectic time during the past weeks is that of Dundee where the Toc H hospital service was recently inaugurated. Members assist in a scheme which ensures a programme is put over to six local hospitals every Monday evening by direct G.P.O. line from the recording studios of Messrs. Largs Ltd., who have offered their equipment and services free of charge. Although most of the programmes are live, many visiting artists and personalities with professional en-

Edited by FRED CHANDLER

agements to fulfil have their contributions recorded and fed on to the programme.

In recent weeks the club has taped James Stewart, who was on holiday from Hollywood, Cliff Richards, Dick McTaggart, the boxer, the Lady Provost of Dundee, Coco the Clown, and Miss Dundee, the winner of a beauty contest. As Secretary Charles Aitken wrote to me, "it does have its moments."

The club provided sound effects to herald the arrival of a space-age Santa Claus when he made an appearance by rocket on the stage of a local cinema; they provided a tape sound relay system in the foyer of another cinema to advertise a forthcoming attraction—*Swan Lake*, and they created the sound effects for the current production of a local dramatic society.

Charles Aitken says that the club welcomes all these opportunities of making recordings under all sorts of conditions. Their activities have resulted in a great deal of local publicity which has helped to recruit new members. Attendances at their fortnightly meetings are now very good and they now have seven lady members. This influx has in turn resulted in a spate of home-cooked refreshments which, he points out, may have something to do with the better turn-out of members.

Another club who are very active held two meetings in December. The first half of the December 10 meeting of the **Rugby Society** was devoted to reports on

FORTHCOMING MEETINGS

BIRMINGHAM: Every Monday at the White Horse Cellars.

BLACKPOOL: Every Wednesday at 173, Church Street.

BOURNEMOUTH: Alternate Tuesdays at the Civil Defence Centre, Holdenhurst Road. (Next: January 26.)

CHESTERFIELD: Every 3rd Monday at the Yellow Lion, Saltergate. (January 18.)

COVENTRY: Alternate Thursdays at the Rotherham's Social Club. (January 21.)

EDINBURGH: 1st Tuesday and 3rd Sunday in month at 23, Fettes Row, Edinburgh 3.

GRIMSBY: Alternate Tuesdays at the RAFA Club, Abbey Drive West, Abbey Road. (January 19.)

LEEDS: Every Thursday at the Hope and Anchor, The Calls, Leeds 1.

LUTON: 2nd and 4th Tuesdays at 17, Dunstable Road.

MANCHESTER: Every Saturday, 6 p.m., at 20, Naylor Street, Hulme, Manchester 15.

NOTTINGHAM: Alternate Thursdays at the Co-operative Educational Centre, Broad Street. (January 21.)

WEST MIDDLESEX: 2nd Thursday at the Co-operative Hall, Station Road, Hampton.

WEYMOUTH: Alternate Wednesdays at the Waverley Hotel.

WINCHESTER: Every Friday at the Ship Inn.

Please state dates and venues for inclusion in this list, plus time if necessary. Meetings normally start between 7 and 8 p.m.

the various sections organised within the Society. Some indication of their activities was given in the reports by Messrs. Brown, Campden and Dawson on the hospital message and hymn-recording service, the town tape project, the youth survey, which had been undertaken with the local Toc H branch, the technical group, and the play-reading section. Following a general discussion on these points, and plans for the tape recording course, and after the usual tape-quiz, the meeting was turned over to Alan Stableford, Secretary of the **National Federation of Tape Recording Clubs**. He gave an invigorating speech pointing out in general terms the enthusiasm so obviously present in the clubs throughout the country, and in particular of the very active club life enjoyed by his hosts. Also present at the meeting was the Secretary of the newly-formed British Tape Recording Club, Mr. A. Alexander.

Their following meeting, on December 17, was a social occasion, and included their Christmas draw and a presentation to Mr. Haskins, landlord of the "Red Lion", where club meetings are held. During the evening members were entertained by the return visit of Mr. Malcolm Shelley, who presented some more of his impersonations.

The play-reading section have decided to tackle their present production in a different way. The intention now, is that with the guidance of Miss Joan Ray-Linger and Alec Lovett the cast will record their parts at home. The various tapes will then be given to the technical section for editing and the superimposition of sound effects to produce the finished play.

No more organised meetings of the society will be held until the end of February when the tape recording course now in progress finishes. Arrangements have been made, however, for a room to be available at the "Gatehouse," North Street, for enthusiasts not attending the course.

The retiring Chairman of the **Coventry** club called to order the last meeting of the year on December 10 and their A.G.M. was under way. Outlining briefly the activities which have seen them through their second year in existence, he reflected on the far-off days when a few recorder owners first met at a school in Radford and started the club, and remarked on how membership has grown during the year from 24 in January to 53 at present.

The three groups formed during the year were also studied. The first, formed under the direction of Ted Bright, was the play-reading section. They have nearly completed their first production, *The Permanent Way*. The technical group, intent on constructing items for club use, have already completed the first work of art, the multi plug strip. The third section is the hospital tape service, led by Mr. Phillips. This is the baby of the club and although not yet fully walking, has proud and ambitious parents.

After all the reminiscing, Bill Palmer gave details of the club's finances, followed with a resumé by Dave Reynolds of the tape stocks in hand. It was agreed that the finances were in a healthy state and the meeting proceeded to elect the new committee. Roy Penfold was elected Chairman and Roy Reynolds and Bill

(Continued on page 37)

Classified advertisements

Rate—Sixpence per word (minimum 5s.); **Trade**, ninepence per word (minimum 10s.); **box numbers**, one shilling extra. **Payment with copy**. Copy should be sent to **Advertisement Department**, "Tape Recording Magazine," 1, Crane Court, Fleet Street, London, E.C.4.

OVERSEAS Oil Exploration Company with world-wide seismic parties offers permanent career to electronic technicians. Work consists in maintaining and operating electronic recording equipment under field conditions. Live generally in camp. Qualifications: H.N.C. or equivalent essential, with practical experience in electronics. Home leave every two years. Box No. 327.

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B.B.C. "Sound" Programme 3 p.m. Sunday, January 17

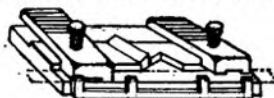
Blackbirds in close-up
Gerald Holmes Tolley presents recordings, obtained from his bedroom window, of blackbirds raising their young, and explains the set-up used.

Loudspeakers

Loudspeakers in Concert Halls, the first of two talks
by Gilbert Briggs.

The programme will be repeated at 6.20 p.m. on Monday, January 25.

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In Next Issue

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And all the usual features.

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able to attend, David Jeffries nobly stepped in at short notice. He quickly prepared a tape showing how not to read an article in a newspaper and proceeded to effectively edit out the unwanted coughs and stammers.

Their Christmas party was held on December 20 and about seventy persons were expected to attend. Knowing that their club meetings are held in a flat, I only hope that not too many eightsome reels were performed which may have been detrimental to the ceiling beneath.

A full programme of events planned for the first few months of the **Nottingham** Society has led to an increase in meetings. In future the club will meet on alternate Thursdays, the next meeting on January 21. The first of these meetings, held on January 7, included a *five-minutes-or-else* interlude in which members had to produce a five-minute tape with a Christmas theme. A prize was given for the best effort, a shilling fine was awarded to any failures.

Mr. A. Mercer, Secretary of the **Dewsbury** club tells me the main object of the club is to help the aged and the charitable organisations in that area by means of a tape service. He appeals to club secretaries for assistance in relaying messages from patients to relatives and friends. His address is: 31, North Park Street, Dewsbury, Yorkshire. Mr. Mercer would also like to hear from anybody who can supply a recording of the Hindenburg Air Disaster. Any offers?

A change of Secretary is announced in the **Birmingham** club where Dennis Brown has taken over from Terry Nurse. Mr. Nurse now compiles the club news

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section of the **British Tape Recording Club's** magazine. Mr. Brown's address is 133, Pool Lane, Oldbury, Birmingham.

Three new clubs are in the making. The first of these is in Ilford where the inaugural meeting of the **Ilford and District** club will be held at the Conservative Club in the High Road on January 22. Jeffrey Langley is the person to contact; his address is: 4, Clifton Road, Newbury Park, Ilford, Essex. The second club to be formed is also the second club in **Blackpool**. In the north Colin Braddock

would like to hear from interested persons. His address is: 266, Waterloo Road, Blackpool. The third name is no stranger to this magazine. Alan Beeby, who writes the sound effects column, wants to form a club in Northampton. Contact him direct at 88, Clare Street, Northampton.

Do you have a personality in your club? If so, a photograph and short history of his, or her, activities are most welcome for inclusion in our series.

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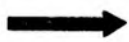
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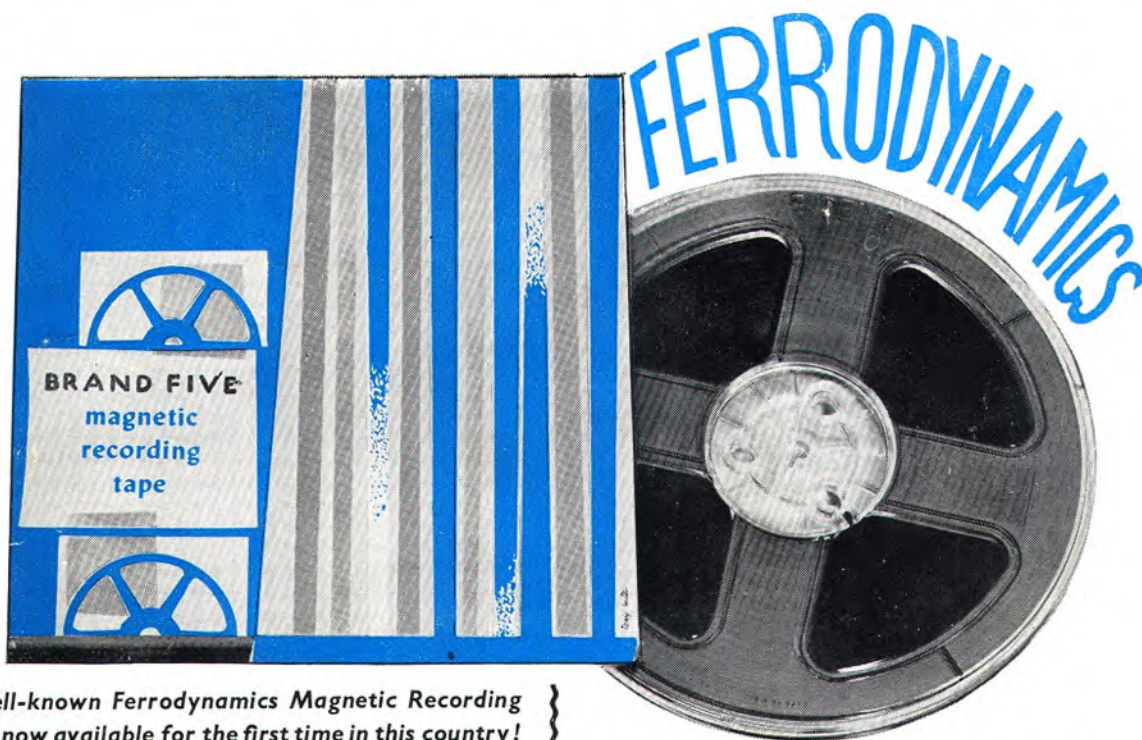
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16-17

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A READER QUIZ

ARE YOU AN AVERAGE TAPE RECORDING FAN?

1. What tape recorders do you have?
A mains model *A battery portable* *None*
2. Did your recorder (the most expensive, if you have more than one) cost?
Under £30 *£30 to £60*
£60 to £90 *Over £90*
3. Do you have stereo facilities?
Tape record and replay *Tape replay only* *Disc only*
4. Do you possess any of the following?
Disc-player *Additional microphone(s)* *Tuner* *Extension speaker* *Mixer* *Splicer*
5. Are you satisfied with your existing equipment?
Yes *No*
6. Have any of your friends, during the past year, asked for your advice or recommendations before buying equipment?
Yes *No*
7. How old are you?
Under 20 *20 to 30* *30 to 40* *Over 40*
8. What sex?
Male *Female*
9. Are you—
Single? *Married?* *A parent?*
10. Where do you live?
Big town or city *Country town or village* *Overseas*
11. Which income bracket are you in?
Under £600 *£600 to £850*
£850 to £1,200 *£1,200 to £1,500*
Over £1,500
12. Do you belong to a club?
Local *National* *International* *No club*
13. Do you "tape-pond" by exchanging messages with friends?
In Britain *Overseas* *Not at all*
14. How long have you been a reader of *Tape Recording Magazine*?
Since first issue *Over a year*
Less than a year
15. How do you get your copy?
Newsagents *Postal subscription*
Club or Library copy *Any other source*
16. Do you read any other tape recording magazine?
Yes *No*
17. How long have you been interested in tape recording and/or hi-fi?
Less than six months *six months to two years* *Over two years*

We have a great respect for our readers—and we should like to know you better. Do you think you are yourself a typical tape recording enthusiast—or are you a strictly individual type?

We invite you to join with us in an interesting experiment which will provide the answer.

If you will fill in the form below and post it to us—it need not take long, as all but one of the questions can be answered by marking a cross in the space provided—we will make a detailed analysis and print in due course a special portrait of "the average reader."

You will be interested to compare this image with the person you are yourself. You will be giving us valuable practical assistance in our task of producing a magazine that will meet your needs.

As you will see, the information you give is confidential—we shall have no means of identifying which readers have filled in individual forms.

When you have completed the quiz, tear out the whole page, fold as shown overleaf, and post it to us. No stamp is required; we will pay the postage.

18. How much have you spent in 1959 on tape recording and hi-fi, including equipment, records, tapes, reading matter?
Less than £5 *£5 to £25*
£25 to £75 *Over £75*
19. Do you contemplate buying a new tape recorder during 1960?
Yes *No*
20. Are you thinking of improving your set-up by buying any of the following?
New microphone(s) *New speaker(s)* *Tuner* *Mixer*
Splicer *Amplifier(s)* *Any other accessories*
21. Have you bought tape for recording use during the last six months?
Yes *No*
22. What type do you favour?
Standard *Long-play*
Double-play
23. Of which size reel do you have most at present?
3 in. *5 in.* *7 in. or bigger*
24. Will you buy more or less tape during the next six months?
More *Less*
25. Have you bought any tape records (recorded music on tape)?
Yes *No*
26. Will you buy any during the coming year?
Yes *No* *Don't know*

27. Have you ever attended an Audio Fair or similar exhibition of tape and hi-fi equipment?
Yes *No*

28. Do you read all the contents of *Tape Recording Magazine*, or are you selective?

Editorial: all *some*
Advertising: all *some*

29. Which editorial features do you find most interesting or useful (you can number these in order of preference, if you wish)?

"The world of tape" news digest
 "We take the view"
 Test reviews of equipment
 News of new products
 Club news
 Stereo notes
 Build-it-yourself articles
 Travel-with-a-recorder articles
 Reviews of tape records
 Cartoons
 Humorous articles
 Technical articles
 Sound effects
 Articles about the use of tape for music, dramatics, education, scientific research, etc.

Articles about combining tape recording and photography

30. Have you any special ideas for improving *Tape Recording and Hi-Fi Magazine*?

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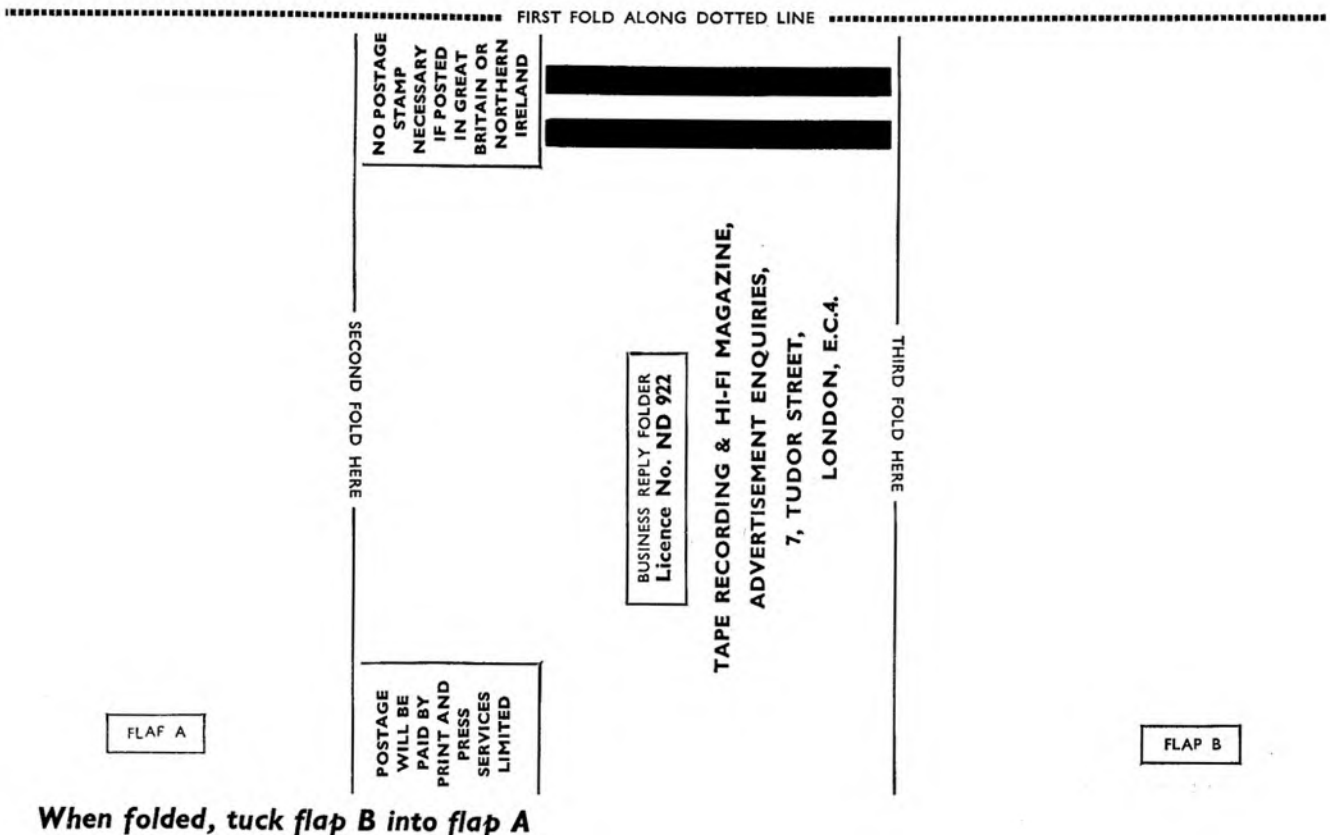
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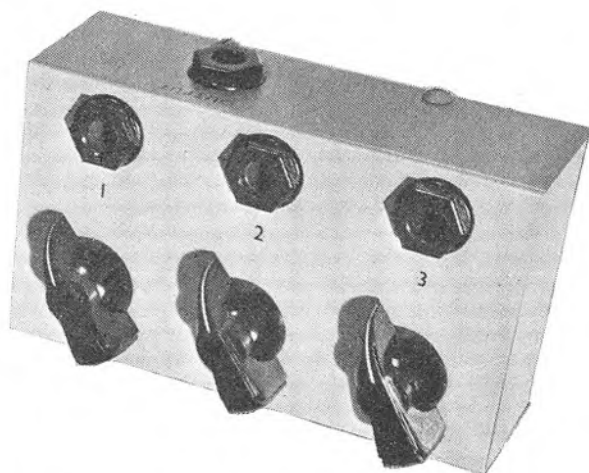
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A DIGEST OF NEWS, COMMENT AND EDITORIAL OPINION

AS Mr. Harold Macmillan flies his way around Africa—the first British Prime Minister to make such a visit during his term of office—he never gets more than a few feet away from a tape recorder.

Close by his side at all public functions and Press conferences moves his public relations assistant, Mr. Harold Evans, twiddling the controls of a battery-portable which records all of the Prime Minister's public utterances.

This is an entirely new experiment, but one which is likely to become standard practice, I imagine, on future similar occasions. It will obviously be of great value to put beyond doubt the casual word, the impromptu phrase, which can so easily be recollected wrongly because it had not been recorded at the time.

Tape in Court

THERE has been further public discussion recently whether tape recordings should be admissible as evidence in court. I say that—until the techniques of editing are more widely understood—they should not.

There have been several recent cases where tape recordings have been admitted as evidence. The problem for those who must weigh the evidence and deliver a judgment is to assess the value of such recordings.

It is absolutely essential that they should understand the extent to which recordings can be “manipulated.”

There is insufficient such understanding. A recent article in *The Spectator* on the subject set out to show how easily false evidence could be faked with tape. In fact, its author only touched the fringe of the possibilities.

His method of selection by use of the pause control is not likely to produce so “perfect” a piece of cooked evidence as is possible by simple splicing and dubbing.

A correspondent who joined in a discussion in *The Times* was more on the ball. “Magnetic tape records are far more vulnerable to ‘editing’ (i.e., faking) than are photographs, and even more so than are shorthand notes,” he explained.

One day we may have a most interesting case in the courts, if a defence counsel cares to call experts to discredit a recording produced in evidence.

Video prospects

QUIETLY, little appreciated except by the technicians and scientists, we are moving forward to the day when video-tape will be of as great general public interest as is sound recording today.

We are already well past the initial phase, in which video-tape was used only for studio copying. During recent months a camera and tape unit has been out in the field gathering news material for television.

The result is that a picture of first-class quality is available for transmission much more quickly than has ever before been possible. One example was the arrival of President Eisenhower in Rome at

lunch-time one recent autumn day; at 7 p.m. local time the video-tapes of the event were in the C.B.S. studios in New York—a result of recording technique, jet air travel, and the international time difference!

We are, of course, now getting a lot of material on our TV screens that has been taped for convenience—“personal” appearances of busy screen stars, and the like.

But it is in the field of news coverage, particularly of foreign events, that the most exciting developments are beginning.

And the dream of electronic photography, using magnetic tape that can be taken straight from the camera and played back over the TV screen, begins to seem much nearer realisation.

LAUGH WITH JEEVES



“I would have to play the Ritual Fire Dance.”



Tape course for a baby giraffe

A BABY giraffe was recently put through a tape recording course at London Zoo.

Giraffes, it seems, are temperamental animals. When a 14-month-old specimen called John was due to be shipped to New Zealand, Zoo officials were worried about his reactions to the strange noises at the docks and on board ship.

Mr. Leonard Ellis, of the Zoo Library, was called in. With a miscellaneous collection of empty bottles, he made a recording of noises comparable to those of the voyage ahead.

And every time John the Giraffe was fed, he was given a blast of the noise-recording, until he was thoroughly acclimatised.

BRITISH HI-FI FOR U.S.

BRITISH tape recorders, as well as high fidelity and electronic equipment generally, will figure prominently in the British Exhibition that will be staged in

All the comics love a tape recorder—and what a boost to fun-making these machines seem now to be giving. In these photographs two famous figures are seen creating pleasure for excited children with Elizabethan machines.

On the left, the world-renowned clown Coco, from Bertram Mills' Circus, is making a recording with a group of youngsters at the School-boys' Own Exhibition.

On the right, Cardew ("The Cad") Robinson is handing over an Elizabethan recorder as a present to the children at the Northwood Sunshine Home for Blind Babies.

With the recorder was a tape made by stars of "Humpty Dumpty," at the London Palladium; now they are getting another tape—of the "Jack and the Beanstalk" pantomime at the Theatre Royal, Windsor. And three other homes are to get recorders as presents, with special tapes.

the Coliseum Building, New York, in June.

The event, which is being organised by the Federation of British Industries, has the backing of the government, the Dollar Exports Council and the British-American Chamber of Commerce in New York.

combine the advantages of video-tape and film.

The process involves conversion of photographic images into coded signals, which are then further converted into variations in the intensity of a beam of electrons.

This electron beam moves over a special type of film, leaving a pattern of electrical charges. After further treatment, taking only a few seconds, the film can be put through a special optical system and the image can be viewed directly, projected, or transmitted by radio.

The system would obviously have considerable advantages over video-tape when it came to editing.

NEW VIDEO PROCESS

AMERICAN scientists have evolved a new technique of recording visual signals on tape, so that they be immediately replayed—and also seen photographically. This method is claimed to

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MANIPULATION OF SIGNALS FOR MUSIQUE CONCRETE

THE purpose of this article is to describe the methods used in magnetic recording and tape manipulation for the assembly and transformation of the various sounds selected for a composition, whether electronic or concrete.

The extent to which tape manipulation can be carried out must depend entirely on (a) the recording equipment (number of recorders, number of tracks available for simultaneous operation, flexibility of the equipment generally), and (b) the expertness of the composer in tape cutting and the extreme patience and care taken in selecting and collating the sounds. The composer should have a fairly wide knowledge of music theory as well as exceptional imagination if successful work is to be the ultimate aim.

What, then, can be accomplished by the enthusiast with limited equipment?

First, the composition of music based on concrete sounds offers considerable scope with a single channel recorder as all the sounds can be derived from those occurring every day. Even if the attempts fail to reach an acceptable artistic standard, the results can at least be interesting and in many cases amusing. Others may not appreciate your efforts, but then "Critics are the men who have failed in literature and art" (Disraeli). This departure from conventional recording and music may be frowned upon by some; but there is, at least, justification in the fascination of achieving something new and in exploring new territory.

By
F. C. JUDD
A.M.Inst.E.



It would be as well to begin by making a few simple experimental transformations in order to gain some experience in tape cutting and joining and in selecting sounds suitable for modification. First, record several different sounds, all having a pronounced "attack." Try hitting a tin box, or tapping china bowls, basins, glass dishes, bottles, in fact anything which has an "attack" sound followed by a decay of the fundamental pitch of the sound to inaudibility.

One can only express these sounds by the use of onomatopaeic words, for example ber-ong (bong) or cher-ing (ching), der-ing (ding), where the syllable before the hyphen indicates the "attack" part of the sound.

MANIPULATION OF SIGNALS FOR MUSIQUE CONCRÈTE

These are the parts that can be removed from the whole sound by simply cutting them from the tape. This is difficult to do unless you can hear the sound whilst moving the tape backwards or forwards across the playback head so as to determine the small portion containing the "attack." Some tape recorders will allow this but most have arrangements for pushing the tape away from the head except during the normal record/playback function.

* * *

The attack part of the sound may be contained in a very small portion of tape, perhaps half an inch or less; but the higher the recording speed the more tape will be occupied for any sound or part of a sound. Having removed the "attack" and rejoined the tape by the usual splicing method, the modified sound can then be re-recorded at higher or slower speed, perhaps with an echo to it, or even re-recorded in reverse, faster or slower, than the original.

It may be mixed with another similarly treated sound or you might like to chop off part of the "decay" as well. It can be included in an endless tape loop and used as a rhythmic background to groups of others. It can be changed into "sets" of different pitch and re-assembled to form a melodic sequence. It can be modified in heaven knows how many different ways. New sounds are limited only by the equipment available and the imagination and patience to use it effectively.

A rhythmic background can be provided by using an endless loop of tape. The sounds contained on it are coupled with the main theme either by superimposing (some tape decks have this facility) or by mixing and recording the two together on a third machine. Sounds of low pitch should be selected for rhythmic background and may be arranged into various patterns, the rate of the beat being controlled by the speed of recording or playback.

* * *

Higher pitched sounds may be slowed down of course, but remember that high frequency response is reduced as the playback speed is reduced. On the other hand a dull sound may be required, so one can deliberately record higher pitched sounds at fast speed, slow down on playback and so lose the original brilliance of the sound, at the



*Those who know
insist on . . .*



WORLD'S LARGEST SALES OF MAGNETIC TAPE

SIGNAL MANIPULATION FOR MUSIQUE CONCRÈTE

(Continued from page 13)

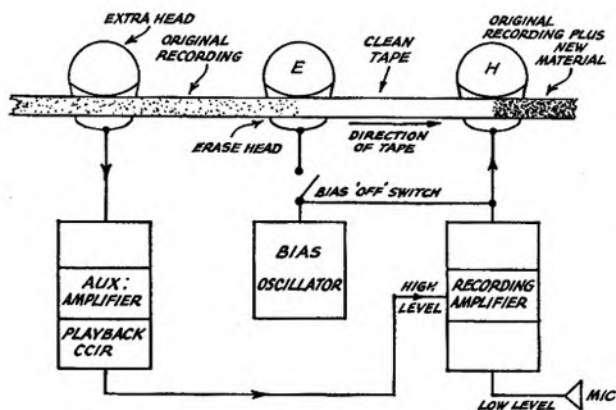


FIG. 1

same time reducing the fundamental pitch by an octave or so.

Recording and re-recording at different speeds in order to obtain pitch relationship between sounds presents problems when the tape recorder has a single speed, but it is sometimes possible to record with the tape released from the capstan, thus allowing the spools to pull the tape through at higher speeds, which can be controlled by touching them lightly.

This method is not suitable for sustained sounds as the speed fluctuations may be too violent. On the other hand the effect could be deliberately introduced to produce a form of vibrato by allowing the tape to speed up and slow down alternately. This will give a "wow-wow" effect and the finished recording can then be superimposed or re-recorded on another tape. The same sort of variation can be obtained by pressing on the capstan or jockey wheel whilst recording at normal speeds. This is a case when wow can be useful and not detrimental to a recording.

* * *

With two recording/playback heads many more effects can be obtained, such as artificial echo's and "doubling" of individual sounds. The extra head can also be used to transfer material already recorded on the tape to the same track, but further along the tape. During this process the original material can be mixed with new material.

Fig. 1 will make this a little clearer. The original recording is actually erased before it reaches the second recording head (H) so the tape reaches this in clean condition. It is only necessary to have an erase head (E) between the two recording/playback heads. An auxiliary

head amplifier with C.C.I.R. replay frequency response characteristic is required for this process and for producing controlled echoes.

To produce echoes the recording is made via the normal recording amplifier and H2, whilst H1 is coupled through the auxiliary amplifier, the output of which is connected to a high level input (gram or radio) on the recording amplifier. See Fig. 2 There must be a

gain control in either the auxiliary amplifier, otherwise echoes will build themselves up into a non-stop crescendo of noise. A little experiment with the gain control will soon show that one, two or three separate echoes can be produced or can be allowed to build up to crescendo and then cut off instantly by quickly turning the control to zero.

The recording speed and the distance between the two heads will determine the timing of the echo. If the second R/P head is placed approximately 2 in. from the main recording head it will pick up a recorded sound 0.2666 seconds later at a tape speed of $7\frac{1}{2}$ in. per second ($1/7.5 \times 2 = 0.2666$ or just over a quarter of a second).

An echo will therefore occur at approximately every quarter of a second, which itself will be re-recorded, picked up again by the second head and passed back to the amplifier for re-recording and so on ad lib, until, depending on the setting of the volume control of the recording amplifier, it will gradually lose strength until it is too weak to be audible. The echo is therefore a decaying one. If the volume control is high each echo will be amplified to a greater extent becoming louder each time it goes around the circuit and will consequently build up into a tremendous noise.

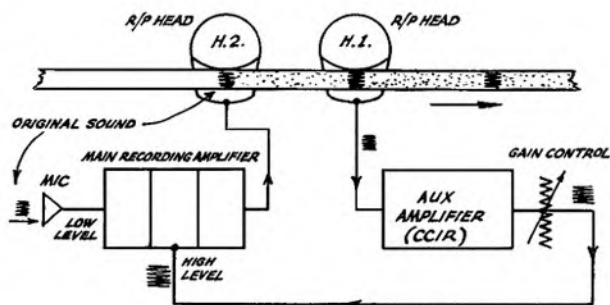


FIG. 2

AUTHOR'S NOTE.—I should be pleased to hear from readers who are interested in these forms of music, but for letters necessitating a reply, a stamped addressed envelope would be appreciated, c/o *Tape Recording Magazine*, 7, Tudor Street, London, E.C.4.

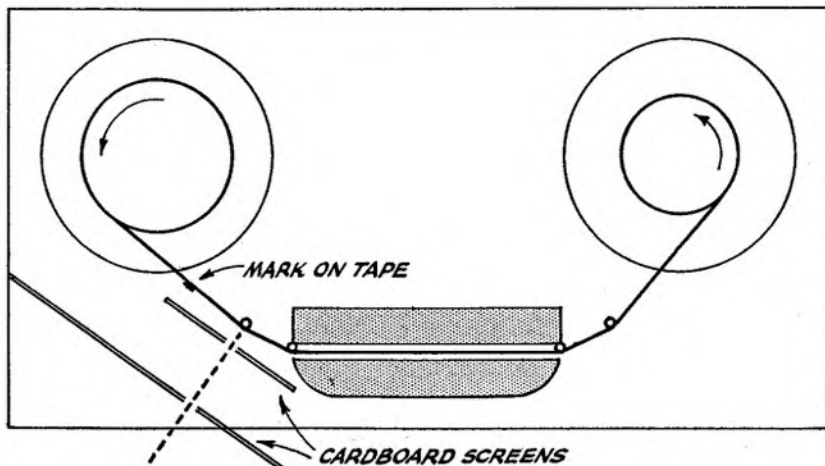
* * *

For the first time this year the British Amateur Tape Recording Contest will contain a special section for "technical experiment"—a field in which Continental competitors have, in the past, made effective use of musique concrète. Watch for further details.

TEST YOUR REACTION TIMES

with your recorder

by J. A. C. McWILLIAM



IT is well known that some people are quicker than others in reacting to external stimuli such as a warning light or a dangerous situation while driving. As a rule, special apparatus is required to measure these times, which are of the order of a few tenths of a second. This article describes how a simple tape recorder can be used to measure reaction times to an accuracy of at least one-tenth of a second.

Figure 1 shows how a recorder can be adapted in a few minutes to make these measurements. The recorder is set to run at the fastest possible speed (at least 7½ ips) and a length of recording tape is prepared as follows. Stick a small piece of coloured splicing tape, about ¼-inch long, on to the outside of the recording tape and wind it back a few feet on to the paying-out reel.

Now erect a cardboard screen, with a narrow vertical slit cut in it, so that only ¼-inch of tape can be seen when looking through the screen. It is best to fix the screen so that a fixed point on the deck, such as a guide roller, is always seen through the slit.

A signal source is also required to feed into the input of the recorder. This

should be operated by a switch or push-button, or it may be possible to use the controls on the recorder itself.

The first test can now be carried out. Having set the tape deck to the record position, the observer views the tape through the slit in the screen, with a hand ready to switch on the input of the recorder as soon as he sees the marked length of tape appear in the slit.

To measure the time between seeing the marked length and switching on the input, the recorder is switched to playback, the volume control is turned up fully and the tape is moved slowly back by hand until the point where the signal first appears on the tape is found.

The distance between the marked point on the tape and the point on the tape which is now opposite to the slit, is measured as accurately as possible with a rule. It should be possible to measure this distance to within half-an-inch without difficulty.

The exact speed of the tape should now be found by marking off a length of at least six feet with splicing tape and measuring the time taken for it to pass

a fixed point on the deck. The reaction time is then given by:—

$$\text{Reaction Time} = \frac{\text{Time for test length to pass X Reaction length}}{\text{Test length}}$$

Test length

This formula applies only to tape decks which have a combined record-playback head. For recorders with separate record and playback heads, the distance between the two heads must be measured and subtracted from the reaction length, when the tape is viewed before passing over the heads and the playback head is set at the greater distance from the slit.

If the reaction time of a group of people is measured as described above, it is likely that only small individual differences will be found, but by making the experiment more complex much greater variations between one person and another will be found.

The simplest complication is merely to stick several pieces of splicing tape of different colours on to the tape and to instruct the observer to press the button only when he sees a certain colour in the slit. This will lead to an appreciable increase in reaction times.

The tests can be made even more elaborate by allowing the observer a choice of three or more buttons to press, corresponding to different colours of marker tape seen in the slit. Each button must produce a characteristic note of different frequency, so that the tape can be played back to check that the correct button has been pressed.

The measurements are made in exactly the same way as described above, except that a run of several observations should be made without stopping the tape. With this modification the speeding up of reaction times, as the observer learns which button to press, can be seen.

A simple circuit using a neon tube which can be used to produce notes of different frequencies is shown in figure 2.

OUR TECHNICAL ADVISORY EDITOR adds: Good quality push-buttons should be used; otherwise leakage across contacts may cause continuous oscillation.

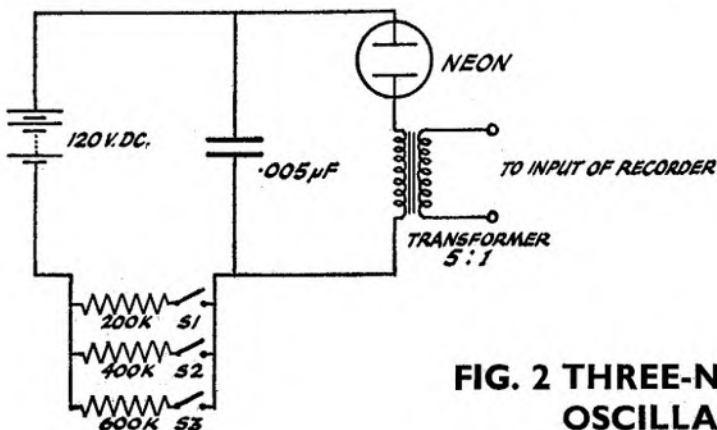


FIG. 2 THREE-NOTE OSCILLATOR

CONTEST CORNER

How we made our winning club tape

The Secretary of the Dundee Tape Recording Club contributes the first of two articles describing the methods used in producing the winning tape in the Clubs Section of last year's British Amateur Tape Recording Contest. This is the first of a series designed to help and guide those taking part in the 1960 Contest.

BY CHARLES AITKEN

WHEN our club decided to enter the 1959 National Tape Recording Contest several problems presented themselves right at the start. Firstly, we had never made a documentary tape before. Secondly, we had no clear idea of what we were going to do. And lastly, perhaps most important of all, we had very little time in which to do the job before the closing date for entries. But we decided to go ahead because it gave us a wonderful opportunity to draw all our members into a combined club effort.

Leonard Douglas, our club chairman, got cracking right away by making a list of available equipment. Although we had no battery portable we did not consider this a handicap, as "outside" work was not essential for our tape. The ability of our various members was also discussed and we made out groups according to the skill of these members.

Then we got down to the task of deciding what we were going to do on tape. The theme "our Town" seemed obvious enough, but after discussion several more problems arose.

Any town in this country is rich in material for documentary work and we found ourselves with enough ideas to fill a dozen long-playing tapes! But we were allowed only fifteen minutes in which to put Dundee across to the judges of the contest. So we took one aspect of life in our city, the industrial problem, and went ahead on that line.

I was given the job of writing the script and doing the story treatment (mainly, I feel, because I owned a typewriter!). My work was made easy because of the very helpful attitude of various people I contacted. These included a former Lord Provost of Dundee, the Public Relations Officer for the jute industry, several executives from the new industries in Dundee, our City Librarian, the Town Clerk's Department, and one or two journalist friends. Without their co-operation we could not have made our tape at all.

Script-writing a documentary is fairly

easy work. Most of your writing is done after all the material is gathered and consists mainly of a linking narrative between the various recordings and interviews.

The most difficult job was the editing work, and we were fortunate to have Leonard Douglas, our chairman, to do this for us. He was also our chief organiser, and had divided the tape entry into three main stages. Stage 1: The availability of equipment, the ability of members, the arranging of interviews and the allocation of work. Stage 2: Gathering material, sound effects, interviews, musical background, and initial editing. Stage 3: Re-recordings, and further recording work, script and story work, final assembly, dubbing, mixing and editing.

We had started the second stage still without any clear idea of what the final tape would be. But we had given several members three questions to ask when they interviewed members of the public:

"What do you think of Dundee as a city?"; "What do you think about the future of the Jute Industry?"; "What do you think about the many new industries that have come here since the war?"

It was on the answers given to these questions that we made our decision about the main theme or story for our tape.

I took all the tapes home and played them over a couple of times to get the "feel" of the material. After discarding some of it because of bad recording or unsuitability, I put all the rest of the tapes down on paper. This writing down of all recorded work may seem unnecessary work but it greatly simplifies later editing. It also enables you to pick out selected words and phrases in a much shorter time.

At our next meeting we discussed the final style of our entry. We arranged for further recordings to be done. Our sound effects and musical background were ready for use. The time for the final assembly of all our material was drawing near and we were all excited at the prospect.

We dubbed all the selected interview work on to one master tape at a speed of 15 ips to make editing easier. All material was dubbed in the correct sequence and Leonard Douglas did a wonderful job with scissors and a splicing kit. Everything was now ready for the final assembly of our contest entry.

Introducing children
to tape recording

GETTING TO KNOW THE MACHINE

MOST children know the tape recorder, at least by repute, as a machine which reproduces the human speech that is fed into it. Here is a starting point. Put the microphone at a fairly high level—about six feet—switch to record, and have a chat about it with the children for a few minutes. Ask plenty of questions and obtain replies from as many children as possible. Then play it back.

It will, of course, be dreadful to you but fascinating to them, particularly to the children whose voices are heard. Grins will appear on their faces and heads will turn towards the speaker of the moment.

At the end you will have the undivided attention of the whole class, for they will wonder what is going to happen next.

Now is the time to point out the big defect in the recording—"Classroom Rumble"—the coughs, the fidgetings, the movements of chairs. If you play it back a second time you can easily put this point over with great effect, thus bringing out the golden rule for all recording—*absolute silence*. They will quickly realise the need for this.

Here is where you let every child have a try at recording. Yes, every child can say his name and age without difficulty. Round the class you go, starting like this—"My name is Freddie Fernackerpan, and I'm eleven years old."

Naturally, you tell them to speak loudly and clearly, but you'll get all kinds of responses, from the gravel-



BY GORDON PEMBERTON

*Headmaster of
Waterloo School,
Pudsey, Yorkshire*

should be worked out in the first instance, and the children can do this themselves. Let the children write their own scripts, but let them also appoint a kind of "Broadcasting Committee" to arrange the programme, with the bare minimum of fatherly advice. The whole thing will probably lack balance, will be very boring to you, and will be bereft of continuity, but let that pass for now. Your aim is to establish confidence at this stage. Technical perfection is a long way off yet.

When the children have made up their programme and practised it a little, record it for them in the best way you can, without taking over the direction of affairs completely. Let as many as possible see how you work the machine and explain such simple terms as record, rewind, wind and playback. Arrange to "broadcast" the recording, whatever its quality and, of course, let them listen to it with the others.

Let the excitement die down by putting the machine away for a week or two before you tackle a second programme.

You will nearly always find, in the early stages of introducing the machine to children, that a few of them are interested in the manipulation of the controls. These children are very often mechanically inclined and the working of the machine fascinates them. There is no reason at all why you should not train them in the actual use of the recorder, provided that you are reasonably sure of their reliability.

Appoint a couple of "Recording Engineers" and let them watch you, giving them the job of "charting" the programme by noting the number on the revolution counter at each break or change. After a while they will become familiar with your use of the controls and will be able to switch on and off for you.

A little additional training and practice will enable them to become competent enough to carry out your orders, thus leaving you free to give encouragement and help to those who are actually making the recording. I know this sounds rather a risky business, with a valuable piece of equipment, but I have done it myself with success and it adds much to the general feeling that the children are doing the whole job themselves—which is the very thing you should encourage for all you're worth.

The Author will welcome correspondence from teachers who are interested in the topics discussed in this series of articles.

voiced boy to the fairy whisper of the timid girl and, because your microphone is not suitably sited, you won't get a good recording. Don't let this worry you.

The playback will demonstrate two things to the children. The first is that distance from the microphone is an important thing, and the second is that the "sharper" voice is easier to hear.

The next thing to do is to make a recording of the whole class. There's bound to be something that they all know—a poem or even a simple nursery rhyme. Record it at your slowest speed and then play it back at a speed higher. The "Donald Duck" effect will cause roars of laughter and they won't at first, believe it is their speech, so you'll have to do it again. This time make them say the words very slowly and then, when it is played back at the higher speed the words will come over clearly enough to be understood. Finally, play it back at the correct speed. All this is just a bit of fun, but it arouses their interest to fascination point and shows them that the machine is not just another "stuffy" piece of apparatus.

Now is your chance to let them perform individually. Bring the microphone down to desk level and invite anyone to say a piece—a poem, a joke, or anything at all. Don't fuss them too much about how to speak close to the mike—let them do what comes naturally. Record about half a dozen and then play back.

Record some more, a few at a time, until there are no more volunteers. Don't force any child! If no more children are forthcoming just pack up the machine and finish there. Above all, don't hog the mike yourself—they've heard your voice often enough, perhaps too often! Put the machine away for a few days and don't give any talks on it, but answer any spontaneous questions from the children.

The next time you bring the machine out you should demonstrate its technical powers. Bring along the school record-

player and the radio, with all the connections you may need.

Select a record they all know and play it through the player on to the tape—then play it back, thus demonstrating that any record can be taped. Play a piece of radio programme on to the tape, demonstrating that the recorder can store up any programme for subsequent playback. They'll all know the difference between a "live" broadcast and a "BBC Recording" and this shows them how it is done.

You might, at this juncture, explain copyright in simple terms and show them that there is a kind of "code of honour" to be observed in this kind of thing.

Now you can introduce them to one really *dynamic* use of the tape. Connect up the microphone and let them do some talking or, if time is short, use their previous recordings. Play these back through the radio speaker, so that the children hear themselves on the loud-speaker that they associate with the BBC. This will stimulate their imaginations, particularly if you suggest that someone might read a story which could be broadcast to a class in another room.

If your children are of average intelligence they will now jump right ahead of you and you'll get a barrage of questions—"Can we do a play and broadcast it to Miss Jones's class?"—"Can we make up a story ourselves?"—"Can I make up a commentary on the School football match?"

Each suggestion will prompt a host of further suggestions and you should accept as many as you can; but let the suggestions come from them, not you. Of course, if you've got less intelligent children you'll have to help them along with a few ideas and give them a little more encouragement, but they'll respond in the same way as long as you don't hurry them.

Some sort of programme, incorporating as many of the suggestions as possible,



At the foot of the Acropolis in Athens

ACROSS EUROPE TO ISTANBUL

—with a tape recorder

BY A. C. WILSON



Recording session with the locals at Novi Beograd

ON August 6, 1959, our family of four, two adults and two children, left Dover by the car ferry for Ostend on the first lap of a five-thousand mile journey overland to Istanbul and back. Among the equipment carried in the car was a Grundig TK 20 recorder and a vibrator to supply it with current from the car battery.

Throughout the trip the recorder was constantly in use, but in three rather different ways.

Firstly, we recorded certain interviews with people we met on the journey, and

these could be used later for illustrating lectures.

Secondly, we recorded special sounds for eventual use on the sound-track of the film we were making of the expedition.

Lastly, we recorded details of the scene as we drove along, or accounts of the day's experience after we had stopped for the night, using the Grundig as a kind of notebook for the storage of facts and impressions which might later be of use as lecture material or for the writing of articles.

As an example of the first use, we recorded interviews at the Studentski Dom, or university hostel, where we

Get it TAPED — to perfection

— naturally



on



SIZES	STANDARD			LONG PLAY			
	FEET	TOTAL RUNNING TIME (11 P.P.S.)	PRICE £ S D	FEET	TOTAL RUNNING TIME (11 P.P.S.)	PRICE £ S D	
3"	150	8 MINS	5 6	225	12 MINS	8 6	
4"	300	16 "	10 0	450	25 "	14 6	
5"	600	32 "	1 0 0	850	45½ "	1 8 0	
5½"	850	45½ "	1 7 6	1200	1 HR 4 MINS	1 15 0	
7"	1200	1 HR 4 MINS	1 15 0	1800	1 HR 36 "	2 10 0	
8½"	1750	1 HR 33 "	2 10 0	2400	2 HR 8 "	3 10 0	
		DOUBLE PLAY		SUPERGRADE			
3"	300	16 MINS	10 6				
5"	1200	1 HR 4 "	2 5 0				
5½"	1800	1 HR 36 "	3 10 0				
7"	2400	2 HR 8 "	4 0 0	1200	1 HR 4 MINS	2 18 6	

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“... the Angelus ringing out across Alpine valleys, Greek and Turkish folk-tunes, the flood-water pouring down into Ancona, argumentative voices in a Greek harbour, the bare feet of children running across a deserted square in Verona, street cries in Salonika, the sound of a shepherd’s pipe played on a steamer off the island of Ithaca . . .”



The Wilson family seen studying maps (and recording at the same time) on the deck of a Greek steamer

stayed in Belgrade. It was here that one of the students insisted in reciting some lines of 18th century English verse into the microphone, following them with his own translation of the poem in Serbo-Croat.

The sounds we recorded were almost too numerous to list; the Angelus ringing out across Alpine valleys to signal the end of the day’s work to the peasants in the fields; Greek and Turkish folk-tunes; the flood-water pouring down into Ancona; the sound of the car driving along a dried-up river bed in Macedonia; the chirruping of crickets; argumentative voices in a Greek harbour; the bare feet of children running across a deserted square in Verona; street cries in Salonika; the sound of a shepherd’s pipe played on a Greek steamer off the island of Ithaca and many more.

The best illustration of the use of the tape recorder as a note book comes from the homeward journey. We had driven all day from Brindisi, where we had landed from a Greek steamer at 4 o’clock in the morning, towards Rimini, and had covered about 350 miles.

It had been a stormy journey, with rain, strong winds and thunderstorms, and these increased as it grew dark.

Finally trees began to go down in front of us, and although they were small and we were able to drive round them or over the topmost branches, we decided to stop for the night at the next town.

This turned out to be Ancona, and as we left the ridge on which we had been driving to descend to sea level, we noticed a cataract of brown water pouring down the road alongside. The town itself was in darkness, owing to a power failure, but there were lights at the bottom of the hill which came from a tangle of cars and lorries unable to go further owing to the floods.

We found a spot on the hillside above the level of the water, but below the ridge and its danger from trees uprooted by the gale, and spent the night there in the car.

The next morning, at 4.30, we went on down into the town and saw some of the damage: cars piled one on top of another by the force of the water, others washed into the sea or through shop windows; buildings partially or totally destroyed; thick mud on all the streets; tree-trunks washed on to the road. The Italian papers later claimed that more than 15 people had been killed and between 400 and 500 buildings damaged.

We were able to record an eye witness account of the disaster from time to time during the twelve hours we were delayed in Ancona in circumstances that would have made it extremely difficult to produce as detailed a record by any other means.

The performance of the TK 20 never gave us a moment’s anxiety throughout the journey. For over 1,000 miles we were driving on unsurfaced roads—occasionally across open country or down dried up river-beds—and our equipment was jarred and jolted in an alarming fashion, as well as being subjected to clouds of dust which settled over everything in the car, and temperatures inside the vehicle of well over 100° F. If anything had gone wrong with the recorder we saw a large number of Grundig agents throughout Western Europe, and as far afield as Greece, but we never had cause to make use of their services.

Our only trouble during the trip developed when we broke the three-pin plug on the lead from the TK 20 to the vibrator. The plastic casing of the plug became wedged under one of the front seats of the car, and cracked when it was being released. It was still possible to use it, but unless it was wedged into the socket very carefully it gave rise to a crackle on the tape when it was being replayed.

Although we had taken with us a wide range of spares for the car and all our other equipment, we had not considered that we might need a spare plug for the vibrator, yet this was the only replacement we ever required. The moral is clear for anyone else contemplating a similar journey.

A final, administrative, detail—the tape recorder was confiscated by the Turkish customs on entering the country at Edirne.

They were very civil about the matter, and explained that it could be sent on to us in Istanbul by train or that we could collect it on our return if we were passing through Edirne on the way home. As far as we could make out their objection was to the tape recorder being carried through the Military Zone between Edirne and Istanbul, but intending visitors to Turkey who want to take their tape recorders with them should confirm this in advance.

Those who want to use their tape recorders for professional purposes would probably find it helpful to write to the appropriate section of the British Embassy in Ankara, who would advise them about the necessary steps to be taken in order to avoid having their equipment confiscated at the frontier.

This article first appeared in the "Grundig Gazette"

BUILDING AN ELECTRONIC MIXER

MIXER

and the facilities
it will give you

By F. C. JUDD., A.M. Inst. E.

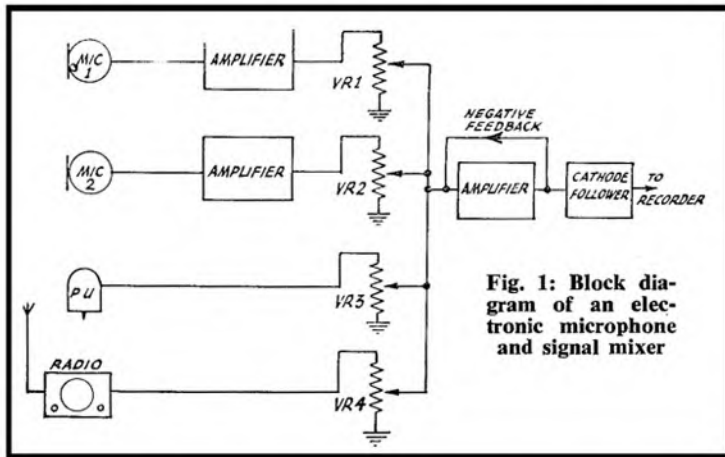


Fig. 1: Block diagram of an electronic microphone and signal mixer

Mr. Judd's first article in this series discussed some of the technical features necessary for a good microphone and signal mixer and briefly described a final design and its specification.

BEFORE going into details of the construction of a three-channel electronic mixer, readers will no doubt be interested in what facilities are offered by a well-designed unit and in the reasons why they should use a mixer at all. No recording enthusiast worthy of that title would be without one; the use of a mixing system for two or more microphones and other

signal sources is not just an asset, but a vitally important aid to producing worthwhile recordings.

Let us assume that you are to record a short play, with music in the background and some sound effects at odd intervals. To do this with a single microphone—a limitation imposed by most recorders—it would be necessary to "superimpose." This is not a good method anyway, and means frequent stopping and starting, to add in music and effects.

A mixer with, say, two microphone channels, plus one for pick-up or

radio, allows speech from one microphone to go straight on to the tape while a sound effect is being faded in on the second channel from a microphone in another room. At the same time, a background of music can be held at low level or faded out, while speech continues, or faded up at some required and appropriate point.

To give another example, suppose a musical recording is being made and speech comments or announcements are required. The mixer will allow continuous music recording from pick-up, radio or microphone source

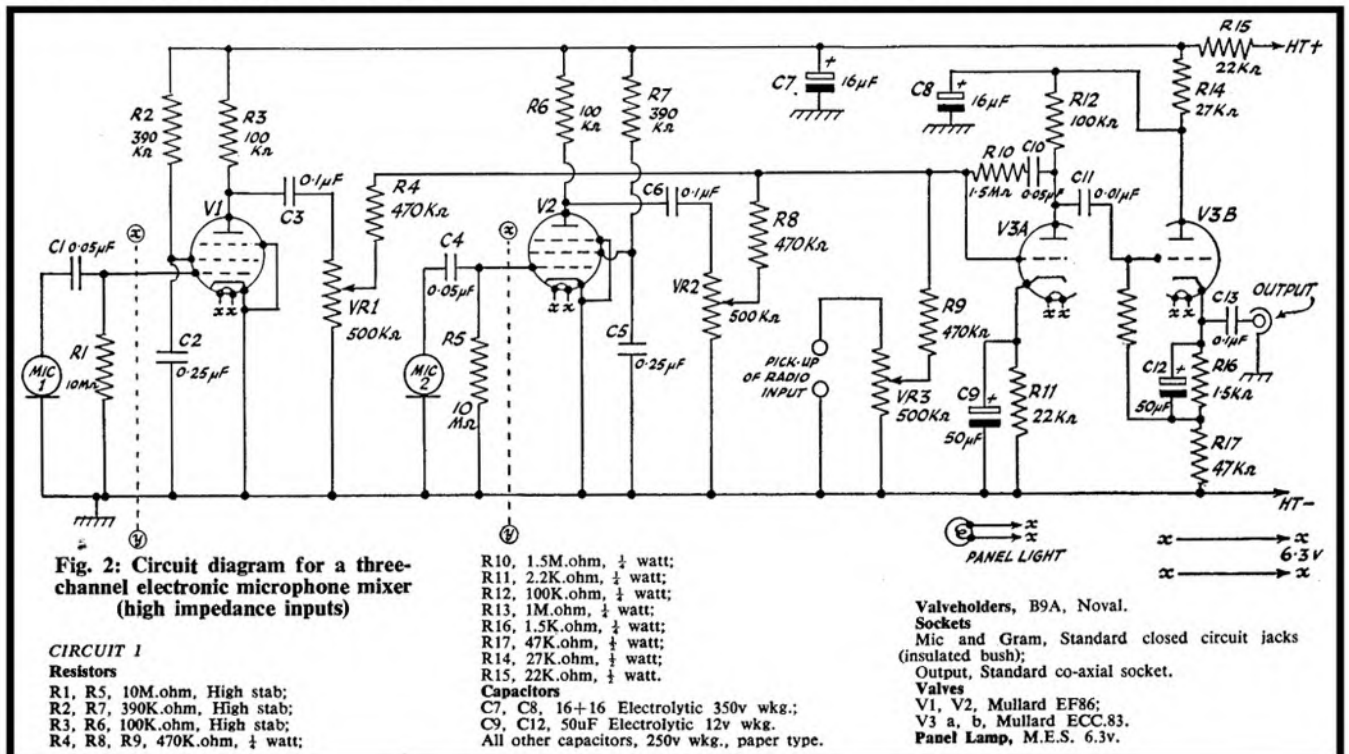


Fig. 2: Circuit diagram for a three-channel electronic microphone mixer (high impedance inputs)

CIRCUIT 1

Resistors

R1, R5, 10M.ohm, High stab;
R2, R7, 390K.ohm, High stab;
R3, R6, 100K.ohm, High stab;
R4, R8, R9, 470K.ohm, ½ watt;

R10, 1.5M.ohm, ½ watt;
R11, 2.2K.ohm, ½ watt;
R12, 100K.ohm, ½ watt;
R13, 1M.ohm, ½ watt;
R16, 1.5K.ohm, ½ watt;
R17, 47K.ohm, ½ watt;
R14, 27K.ohm, ½ watt;
R15, 22K.ohm, ½ watt.

Capacitors

C7, C8, 16+16 Electrolytic 350v wkg.;
C9, C12, 50uF Electrolytic 12v wkg.
All other capacitors, 250v wkg., paper type.

Valveholders, B9A, Noval.

Sockets

Mic and Gram, Standard closed circuit jacks (insulated bush);

Output, Standard co-axial socket.

Valves

V1, V2, Mullard EF86;
V3 a, b, Mullard ECC.83.

Panel Lamp, M.E.S. 6.3v.

This is the second article in a series of "build-it-yourself" articles describing a three channel mixer unit.

and for speech to be added while the music is faded down to a lower level.

This cannot be done properly or with the same smooth effect using a "superimposing button."

A mixer also allows a recording to be taken from another machine and, at the same time, to fade out unwanted sections while announcements, background music, or effects are faded in without noise of interference to the other signals.

The uses of a good microphone mixer, in fact, are almost unlimited. Those whose interest lies in combining cine-film with tape would find endless uses where sound effects, music and speech can be added smoothly and with professional style, to the sound recording.

The block diagram of Fig 1 is given to show how a mixer will accept different signal sources all at once, individually, or with one or the other faded up or down.

Each microphone has its own amplifier to boost the signal first; it is then fed to gain control (more commonly called a "fader"). The high level signals from pick-up, radio, etc., are fed directly to their respective "faders."

All the faders are then connected into a common amplifier, after which the mixed signals are fed through a "cathode follower" output stage to the recorder.

The "cathode follower" is a special non-amplifying valve circuit which provides a low impedance output and therefore permits the use of a fairly long cable between the mixer and the recorder without loss of high frequency response. Each of the faders VR1, VR2, VR3 and VR4 can be operated independently,

each controlling the level of the signal into the common amplifier.

In the mixer circuit of Fig. 2 the common amplifier (V3a) has sufficient negative feedback to reduce the gain to nearly zero and to help preserve the overall frequency response. Signals fed into the high level input (radio, pick-up, or corrected tape) and the amplified signals from the microphones will, however, come out of the mixer at slightly higher level, which means that the mixer has a slight gain of its own.

This is useful, of course, and the high level output enables the mixer to be fed directly to the pick-up or radio input socket on a recorder, which minimises the risk of hum pick-up and leaves the microphone input on the recorder free to operate as a third microphone channel.

CIRCUIT FOR A COMPLETE THREE CHANNEL MIXER

The circuit diagram is divided into two parts, Fig. 2 showing the actual mixer circuit and Fig. 3 a power supply which may be built into the mixer case.

The mixer can, of course, be operated from an external supply, often found on the tape recorder itself.

The circuit of Fig. 4 shows the connections required for low impedance microphone inputs, but great care must be exercised in the mounting of the microphone transformer in order to avoid hum pick-up from the mains transformer of a built-in power supply. It would be advisable to build the power supply as a separate unit in this case, because induced hum can be very difficult to get rid of.

The microphone amplifiers (V1) and

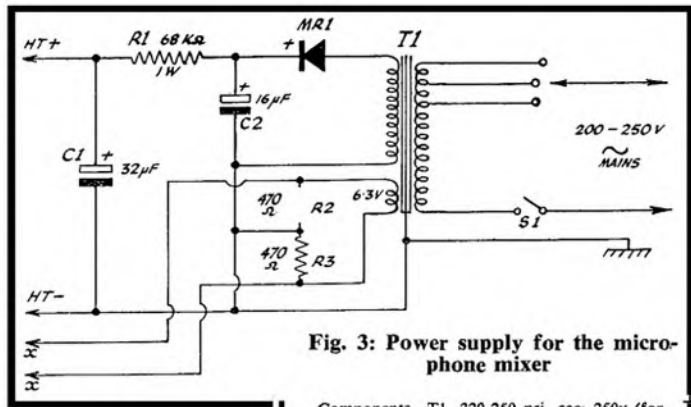


Fig. 3: Power supply for the microphone mixer

Components—T1, 220-250 pri. sec; 250v (for HT) 6.3v 1A (HTRS).
MR1, HT rectifier (max. current drain 5 m/a).
C1, C2, 16+32 Electrolytic, 350v wkg.
S1, Toggle type on/off switch.

(V2) are EF.86 low noise valves, while the common amplifier (V3a) is half of a double triode type ECC.83. All the signals are fed into this stage via the fader controls VR1, VR2 and VR3, and the valve has applied negative feedback between anode and grid.

The anode load connections can be modified to decrease the output voltage of the mixer to about 40mV, which may be necessary for recorders having only a single low level microphone input. Otherwise, the output voltage is about 800mV and fed to the output socket via the "cathode follower" valve (V3b), which provides a low impedance (approximately 600 ohms) output and, therefore, allows the mixer to be connected to the recorder via a fairly long cable.

The circuit given in Fig. 2 is suitable for direct connection of all types of crystal microphones, high impedance ribbon microphones (such as the Lustraphone Ribbonette), or any low impedance moving coil or ribbon microphones, providing they are connected through a suitable matching transformer.

If it is desired *always* to use low impedance microphones, the matching transformers may be mounted in the unit and connected into the grid circuit of the microphone amplifiers at X and Y as shown in Fig. 5. The existing part of the circuit is, of course, removed.

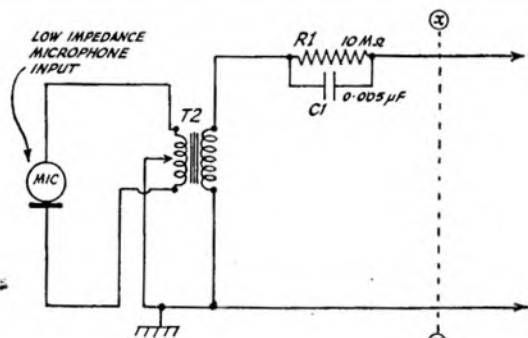


Fig. 4: Alternative mic. input circuit for low impedance microphones.
T2=microphone transformer

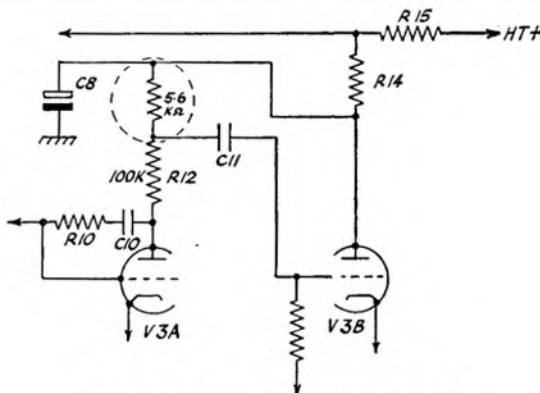


Fig. 5: Modification to circuit of Fig. 2 for 40 mV output

BUILDING A THREE CHANNEL MIXER

(Continued from page 21)

PERFORMANCE

The maximum output voltage of the mixer as per the circuit of Fig. 2 is approximately 800 mV, and this output is derived from an input voltage of 3mV at each microphone socket, or approximately 250mV at the pick-up or radio socket.

If a lower output voltage is required, it can be obtained by tapping along the 100K.ohm anode load (R.12) of V3A. This is done by using two resistors in series; for example, if an output of 40mV is required, a 100K.ohm and a 5.6K.ohm resistor in series would be required. The 0.01 μ F coupling capacitor is taken to the junction of the two resistors as shown in Fig. 5.

FREQUENCY RESPONSE

The response of the mixer, measured between a microphone input and the output terminal, is flat to within ± 3 dB relative to the level at 1000 cps from 20 to 20,000 cps. From the high level input, the response is within ± 2 dB over the same frequency range.

HUM AND NOISE

For full output the hum and noise level is better than - 50dB.

CONSTRUCTION

The prototype mixer was housed in a mild steel case, 11 inches long, 5 inches high, and 4 $\frac{1}{2}$ inches deep, with a small chassis mounted behind the front panel. A case of this size is large enough to accommodate all the components, including the transformer for the power supply, which, in the prototype, was mounted behind the front panel next to the chassis.

The front panel is also large enough for comfortable distribution of the three fader controls and the three input jacks and the output co-axial socket may be fitted on the back of the case.

Those who wish to construct their own mixer will find all the necessary information and a plan layout of components etc., in my next article. Those who wish to go ahead and construct, using their own layout, should, however, note the following.

1. The two microphone jacks must be insulated from the front panel, and self closing jacks should be used for each input. Jacks with insulating bushes are available.

2. The grid and anode capacitors of the microphone amplifiers must be as widely separated as possible, otherwise crosstalk between channels will occur, owing to capacitive coupling between these components.

3. A "humdinger" circuit is necessary, even if the mixer is used from an external power source, and two 470 ohm resistors should be connected across the heater supply and their junction connected to earth as in Fig. 3.

4. The earthed connections of the microphone jacks should be taken to an earthing tag under one of the valve-holder fixing bolts of the appropriate valve.

Stereo Notes

"Musical chairs is good stereo"—more ideas, please

THE number of readers who have replied already to the request for suggestions concerning our feature "Let's make a stereo play" show that a good deal of thought and action is going on in the realm of amateur stereo recording. The breadth and interest of the subject matter has also persuaded us to invite readers to send us ideas on material for stereo recording generally, whether or not they seem to be potentially useful for an eventual play.

A letter from John Hone, London, W.12, justifies special attention as an indication of the ideas that are coming forward—and because this is (still) the time of the year when the activities he deals with are in fashion.

"I believe that your first efforts in making a stereophonic recording," he writes, "should be quite simple. This is the time of the year when we all have parties—and what better than to record one of them?"

"First, the guests arriving (preceded by realistic street sounds and an announcement). Guests having drinks and joking. General atmosphere. Somebody puts on the record player, and everybody dances. Get someone who has an easy-to-remember voice to talk while they are dancing around (nice stereo effect). Later, some party games.

"Musical chairs is good stereo. So is

dancing the conga—especially when the line of people leave the room to make a detour of the other rooms in the house and finally return to the party room laughing and exhausted.

"So long as the producer keeps guests in the positions he wants, and sees that he has a competent M.C. (briefed well beforehand) and that the microphones are kept clear of the guests, either by being roped off or slung high up, the results should be quite realistic and the finished tape should need little, if any, editing (which is a problem in itself).

"This may not be a good example of drama in stereo, but it will give valuable information about stereo position and atmosphere in general."

An award of a spool of tape is now offered for the best letter received by March 31st dealing with "Ideas for stereo recording." Letters can describe recordings actually made or give suggestions as to possible material and its treatment. Address them to "Stereo subjects," *Tape Recording and Hi-Fi Magazine*, 7, Tudor Street, London, E.C.4.

Although American and British experience with stereo is not an exact parallel there is so much in common between the two that we are able to learn much from observation of what happens across the Atlantic. New York experts indicate that stereo still has not consolidated there as it was expected to do.

"The public is still confused" writes Harold C. Schonberg in the *New York Times*. Later he mentions what we might regard as one of the probable reasons: "It takes good equipment to get optimum results from a stereophonic disc, and good equipment is expensive." Perhaps, as in this country, too many people are ready to dismiss stereo on the strength of inferior examples.

The way ahead is illuminated, however, by what is described as "a spectacular improvement" in the quality of the stereo disc. "No longer do instruments wander from speaker to speaker. Even in a disc of solo piano music, or voice with piano accompaniment, the stereo disc in richness of colour, depth and 'tangibility' has it all over the monophonic equivalent."

In a direct comparison between the two countries, Fritz A. Kuttner, after a visit to Europe, decided that there was nothing one could call even the beginning of a high-fidelity movement on this side of the Atlantic, blaming the staggering luxury tax for the fact that the average British music lover could not instal a first-rate home sound system. He praised our recording and broadcasting studios highly, however.

Hi-Fi
HARRY
by rich

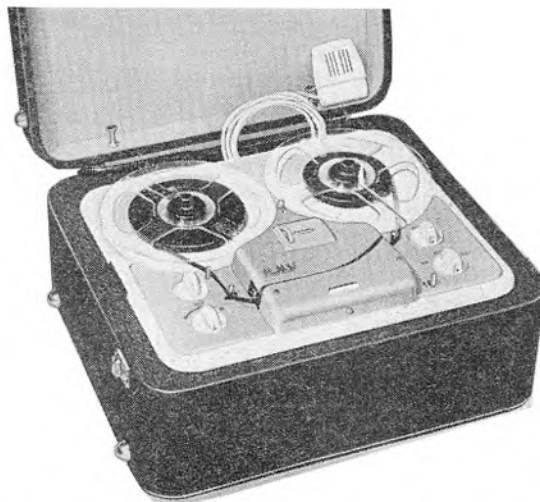


"This is a good one—at the second chorus the chap in the flat below bangs on the ceiling"

Equipment Under Test

THE H.M.V. DSR I

By H. BURRELL HADDEN



THE H.M.V. Tape recorder model DSR1 is the latest in the line of tape machines made by the E.M.I. Company, and the first to be manufactured in the lower price bracket.

As is well known, this company produces the professional machines used by many recording companies and broadcasting organisations throughout the world, and much of the experience gained in these fields has gone into producing this portable machine for the domestic market.

Because of the lower price range—this machine sells for £50 whereas the professional machines cost £500 and more—one might expect that something had to be sacrificed. This is indeed so, but the makers have managed to include a facility that is seldom found in any but professional machines, that of a separate replay head and amplifier so that a recording can be monitored from the tape a fraction of a second after it is made, without the necessity of rewinding the tape.

What then has been sacrificed? Firstly the tape transport mechanism is not of such a high standard as has previously been seen in E.M.I. equipment. The machine has a noticeable flutter, although the wow was quite satisfactory. The flutter appeared to be due to the use of a single ball race on the rubber pinch wheel, instead of two races.

Secondly, the bearings on the capstan flywheel shaft were not as good as I would have liked.

Thirdly, no provision is made for lifting the tape clear of the tape heads during fast wind.

Some minor sacrifices have also been made. The mains lead is by no means long enough,

There is no lead, or even a jack plug supplied for use with the radio input socket.

Having aired most of the deficiencies of this machine, what of its good points?

The separate replay amplifier is a god-send to any serious recordist, as an instant check on balance and quality is always available. It can also be used

for producing the echo effects often heard on "pop" recordings.

The record and replay heads are of the fine gap type, enabling a good replay frequency response to be obtained. Using the *Tape Recording Magazine* Test Tape, the replay response at $7\frac{1}{2}$ ips was within ± 3 dB of the maker's specifications from 40-10,000 cps and was about 7dB down at 12,000 cps, 14dB down at 15,000 cps. Hence this machine is capable of giving a very good account of pre-recorded tapes.

Unfortunately the overall record/replay response was not so good. The response was flat within ± 3 dB between 40 cps and 6,000 cps, but then started to fall, and was -6 dB at 10,000 cps, -12 dB at 12,000 cps, and unmeasurable at 15,000 cps.

No attempt was made to find the cause of this loss, and it may indeed have been peculiar to the machine tested.

At $3\frac{3}{4}$ ips the response again fell off more rapidly than was expected, being flat ± 3 dB only as far as 4,000 cps, and falling rapidly above this to -16 dB at 8,000 cps.

The magic eye level indicator is very easy to read, being of the "column" type, and a switch position is provided to enable record levels to be set before the tape is set in motion, a very useful feature. The position indicator is of the digital counter type, and provides an accurate resetting guide.

Tape rewind is accomplished quite quickly, in less than one minute, but the wind is not a very even one—so often the case with a high speed wind.

MANUFACTURER'S SPECIFICATION

Voltage: 200-250 A.C. only.
Consumption: maximum 95 watts in record position.
Size: $15\frac{1}{4} \times 14\frac{1}{2} \times 7\frac{1}{2}$ in.
Tape Speeds: $7\frac{1}{2}$ and $3\frac{3}{4}$ ips.
Maximum spool size: 7 in.
Frequency response: 50-10,000 cps ± 3 dB at $7\frac{1}{2}$ ips.
40-12,000 cps ± 5 dB.

Bias frequency: 65,000 cps approx.
Input sensitivity: 3m/v. across 500 K.ohms.

Outputs: C.C.I.R. corrected to feed external amplifier. 100 m/v. across 200 K.ohms. External loudspeaker jack which, when in use, mutes internal loud-

speaker. Signal-to-noise ratio was quite adequate, and there appeared to be sufficient record gain to use a low level microphone, although this necessitated turning up the record level control almost to full.

A tone control, top cut, is provided for use with the internal amplifier and loudspeaker, but this is inoperative when the quality amplifier output is used. The replay amplifier can be used as a straight-through amplifier by feeding a signal in at the quality output jack, and the response obtained in this way is excellent.

A safety locking device is incorporated in the record switch to prevent inadvertent erasure of a recording, and there is also safety interlocking between the fast and the normal speed controls.

The microphone supplied is a crystal type which gives fairly good results.

The operating manual contains some excellent advice concerning the regular cleaning of the tape heads. Unfortunately this cannot be done without removing the plastic cover and the control knobs. If a suitable Allen key were supplied with the machine, such a maintenance session would be much simpler.

To sum up, in spite of the objections above this is a machine worth buying if the separate replay facilities are desired, but it is to be hoped that the E.M.I. Company will soon produce a machine, say in the £80 bracket, in which fewer compromises would need to be made to keep the price down.

We look to them to be leaders in this domestic field as indeed they are in the professional side of the industry.

speaker. Output to match 3-5 ohms.
Loudspeaker: high flux elliptical, 7 x 4 in.
Valves: 6BR8, 12AX7, EL84, ECL82, EM84, two diodes, C3B, bridge rectifier.
Wow and flutter: 0.3 per cent.
Signal-to-noise ratio: ± 45 dB.

Construction: separate record and playback amplifiers, plus three-head system allowing virtually instantaneous playback of recorded signal. Solenoid operated servo brakes. Pause control giving instantaneous stop-start.

The DSR1 is supplied with a spare spool and a 1,200 ft. reel of tape carrying a selection of special demonstration recordings.

V.I.Ps PEOPLE IN THE NEWS



Mr. V. P. Cole Mr. M. H. Duck

Grundig (Great Britain) Ltd., announce the appointment of two new directors to their board—**Mr. V. P. Cole** and **Mr. M. H. Duck**.

Mr. Cole joined Grundig as Sales Manager in 1955 and later became General Sales Manager. He joined Marconi as a wireless operator in 1917 and has spent the whole of his working life in the radio trade.

Mr. Duck has been company secretary since Grundig (Great Britain) Ltd., was formed in 1952.

* * *

Mr. Ralph Gough, general manager of Fi-Cord Ltd.—makers of the miniature recorders—recently returned from a three-week tour of the United States and Canada. His ten city round of dealers and stockists which ended on January 23, included New York, Chicago, Buffalo and Toronto.

* * *

Mr. Victor Weake, Chairman of Audio Fairs Ltd., has taken up the appointment as Chairman of the newly-formed Derritron Group of electronic companies. He relinquished his directorships of Pamphonic Reproducers Ltd., Pye Marine Ltd. and W. Bryan Savage Ltd. at the end of the year to take up his new appointment.

Mr. Weake is also a director of Eastern Nigeria Broadcasting Ltd., and Chairman of the scientific body, Society of Environmental Engineers.

* * *

Among the new knights in the New Year's Honours List was **Mr. Joseph Lockwood**, Chairman of E.M.I.

The new Members of the British Empire include **Mr. L. G. Fowell**, Executive and General Manager of Pye Ltd., West Drayton, and **Miss D. I. Nisbett**, Music Bookings Assistant at the B.B.C.

* * *

Mr. Eddie Ramonde, director of Sound Research Unit, Victoria, has been appointed cameraman-sound recording engineer for the Thomas De La Rue Co. Ltd., S.R.U. will cease to exist.

Mr. Ramonde will be responsible for the making of industrial films and for new techniques applied to the recording of conferences, meetings and laboratory tests.

THE BEST SOUNDS COME FROM A GOOD HEAD

By G. G. CHITNIS

AS a lens is to a camera a magnetic head is to a tape recorder. In fact, it is more than that. The magnetic head of a recorder has to do the job which the lenses of a cine camera and cine projector do between them. It has to record and reproduce a programme to the highest possible degree of perfection.

No one questions the fact that the mark of a camera's excellence is, first and foremost, its lens. An expert would scorn a camera with a lens of $f/11$ or $f/6.3$; it is the $f/2.8$, $f/2$, or $f/1.5$ lens that interests him.

It is not sufficient to judge a camera by the firm that manufactures it; there are cameras on the market ranging in price from thirty shillings to £300, all made by the same firm.

It is the specification and quality of the lens which tells us what the camera is worth. Precisely the same applies to a tape recorder. A tape recorder can be as good as, and no better than, the heads it uses. But the value of the lens of a high quality camera may be two-thirds of the price of a camera itself, whilst a set of high-quality heads used in a first-class tape recorder need constitute no more than one-tenth of the cost.

To judge the quality of a recording and playback head the following details must be taken into account.

Firstly, the gap in the head must be as fine as possible, to ensure high frequency response with low background noise when used at the lower speeds.

Secondly, the head construction must be absolutely straight, to ensure perfect tape contact combined with a minimum friction with the head.

Finally, the head must be perfectly screened.

Over the last two years there has been a rapid development in the manufacture of magnetic tape, and tapes are now available for recording frequencies up to 20,000 cps with a very low background noise at a speed of $3\frac{1}{2}$ ips; but the heads used in most tape recorders are incapable of making use of this development.

As a result, one has to use the higher speeds to obtain the best quality.

This means, not only that the tape consumed is two or four times as much as it need be, but also that the tape recorders themselves have to be larger and heavier in order to provide reasonable playing time. All this results in a coffin-size instrument with a handle on it, which is palmed off as a portable tape recorder.

On the other hand, it is true that the finer the gap of the sound head, the more precise must be the amplifier con-

struction, tending to increase production cost.

Considering these partially conflicting points, the golden mean must be found between the gap used in the head and the quality and price of the amplifier. At present the balance chosen by the Continental manufacturers of quality tape recorders is to use well-screened sound heads with a gap of 3.5 micrometers (0.0001375 in.), giving a frequency response of up to 30—16,000 cps at a tape speed of $3\frac{1}{2}$ ips and a response of up to 10,000 cps at a speed of $1\frac{1}{2}$ ips.

At these speeds the noise level is kept at 60 dB below the recording level.

M/S Bogen, of West Berlin (who manufacture over 70 different types of magnetic heads), produced in 1957 a recording head with one micrometer (just under 0.00004 in.) gap which could obtain a frequency response of from 30—16,000 cps at $1\frac{1}{2}$ ips still keeping the noise level 50 dB below recording level.

Advice Bureau

In each issue we shall reprint one specimen question and answer dealt with by our Advice Bureau. Others will be dealt with by post. When sending queries use the coupon below.

Q. Can you advise me whether any firm has produced a pause control cable release for tape recorders on the lines of cable releases for cameras that can be operated from a distance of several feet from the apparatus itself? If not, I feel that this is a coming essential for any specification of the more expensive range of tape equipment and that manufacturers working on new models might well incorporate it.—**M.F.B., Rugby.**

A. We have no knowledge of any firm specialising in cable releases of sufficient length to suit your requirements. We have heard of one recorder being adapted for this purpose, using a length of Bowden cable, but do not know the make of recorder or therefore the particular characteristics.

It is possible to operate a pause control remotely using an electronic device based on the principles used to operate model railway signals and points, but once again the differences in recorders make generalisation very difficult.

TAPE RECORDING AND HI-FI
MAGAZINE ADVICE BUREAU

JANUARY 27, 1960

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DATA BOOKLETS

RR11 Mullard Type C Tape pre-Amplifier (24 pages)...	2	6
DB11 Quality Amplifiers—Selection of popular types	4	6
RR9 The Jupiter Stereo Amplifier and pre-Amplifier	2	6
RR5 The Mercury Switch tuned FM tuner (Jason Design)	2	0
DB8 Tape and Wire Recording (Special offer at reduced price)	2	6

Please write for full price list of components either direct or via the Magazine Inquiry Service.

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Sound Effects

ALAN EDWARD BEEBY, who has had years of experience in devising and recording sound effects, continues his regular column of advice and ideas. If there is an effect you want, and which is causing difficulty, write to him for aid.

WHEN giving advice on certain sound effects, particularly those of a necessary violent nature such as a car-crash or an explosion, I am often criticised for including the instruction: "This effect should be purposely over-recorded." The objections usually come from what I term the "rule-book brigade," those unimaginative souls who gaze at you in horror should you so much as hint at a course of action which is not included, or otherwise frowned upon, in the (to them) all-sacred Operating Manual of the Tape Recorder.

Deliberately over-record

"How can you possibly hope to obtain a nice, clear-cut recording," one of them said to me recently, "if you deliberately over-record it in the first place?"

Well, in the first place, did anyone ever hear a "nice, clear-cut" recording of a car-smash or an explosion? I doubt it! There's nothing particularly "nice" about either of these occurrences and, as for being "clear-cut," well, that's anybody's guess!

I suppose what they really meant was "realistic," which brings me to my point: and it is this. If the sound which you are trying to imitate is violent in nature, then your effect must also give a similar impression. And the best way I know of doing this is by *deliberately over-recording*.

Take a car-crash, for instance. The impression required here is one of sudden violence and confusion; the answer, therefore, is to magnify and distort each "sound-ingredient" out of all proportion to its normal level, thereby emphasising the dramatic shock-content and shattering intensity of the effect.

This does *not* mean, however, that the effect should deafen anyone on playback. It must be reproduced at normal volume, otherwise it will sound isolated and false, and in this sense will stand out in unnatural relief from the rest of the

recording. In composing an effect of this type, I usually "build" the noise on to a spare piece of tape; then, when I'm satisfied with the result, it is dubbed into its place on the recording at normal level.

One of the most realistic "crashes" I ever produced was that of a collision between a railway-train and a lorry at a level-crossing, achieved by this same method of over-recording. The whole thing was done on a table-top with materials consisting of a twelve-inch steel ruler, a sheet of glass, some small pieces of metal, a biscuit tin, a handful of fine grit and a hair-dryer.

The same thing applies to explosions. Try this experiment. Take a large, fairly hard cushion, into an empty room giving it a reasonable amount of echo. Smack it hard with a stick, at the same time recording in the normal way.

Explosive effect

The resulting effect, you will agree, would not be of much use in the "explosion" category, although it might just about pass as the bursting of a distant rocket.

Now do the same thing again, but this time recording at maximum gain. This gives an explosive "thump!", followed by a brief reverberative fade-out, and is suitable for anything ranging from a small hand-grenade to a near shell-burst.

Incidentally, a very effective impression of distance may be obtained by calculated use of the gain control in the dubbing stage.

To sum up, we may say that the practice of over-recording in sound effect composition has two main functions. The first is to implant any necessary sensation of violence into the effect, and the second, equally if not more important, to disguise the source of the original sound.

After all, as in the train-crash effect, a few small pieces of metal thrown on to the floor and recorded at normal level will *still* sound like a few small pieces of metal being thrown on to the floor.

And that would never do . . . would it!

AMERICANS BOOST TAPE RECORD SALES AS NEW YEAR OPENS

THE year 1960 is opening in the United States with a tremendous boost for tape records, particularly for four-track stereo recordings. Now that the big firms like Decca and London Records have waded in, sales curve look as though they must be climbing steeply.

These four-track, 7½ ips recordings have achieved a truly high quality and prices have at last been brought into some sort of balance with discs.

It is a safe prediction that before this year is out American hi-fi enthusiasts will have as wide a range of music available on tape as on disc. One of the biggest names in US tape is Herbert L. Brown, President of the Magnetic Recording Industry Association. Mr. Brown has been arguing publicly that the stereo issues have transformed tape prospects.

There is a potential market of 95 million Americans, he says, who are likely to graduate through stereo disc to stereo tape. "The stereo disc could be called the best thing that ever happened to stereo tape," he summed up.

There are now two major distributing organisations handling tape records from all the companies, and so ensuring an efficient national distribution to dealers and music stores. About two dozen firms are issuing four-track stereo now, and about 500 titles are already on sale.

The participation of London Records has meant a big forward jerk, for their catalogue contains some choice items, particularly operatic, which tape fans will now have available for the first time.

At the same time, four-track recordings have not seriously undermined sales of two-track 7½ ips and it looks as though

the two will sell side by side. Nor have the tapes in cassettes struck a death blow at separate reel loading. The old and the new methods both have their future.

Meanwhile, the hi-fi magic is still in the air. The sound system in your home is a matter of prestige for many folk. When they go buying a new home, they study the acoustics as carefully as the setting.

MUSIC ON TAPE

MUSIC ON TAPE LIMITED ask us to point out that, though this phrase may have appeared in the advertising of other firms, they have been issuing tape records at 3½ and 7½ ips under the "Music on Tape" label since August 1958. They are now also issuing stereo recordings.

Music on Tape Ltd. is an entirely independent company, having no connection with any other disc or tape company. Its address is 6, Laurence Pountney Hill, London, E.C.4.

TAPE DEMONSTRATIONS

TAPE lecture-demonstrations are becoming popular with the public. *Tape Recording Magazine* is compiling its own list of lecturers who are willing to visit clubs and other suitable organisations to speak and, when complete, information about this list will be made freely available.

Mr. Roy Russell, a director of the Wyndor Recording Co. who has recently visited a variety of audiences reports an astonishing range of questions, ranging from "Will the Wyndor catch all the sounds of a brass band as it does a string quartet?" to "In a tropical country, what is the effect on the head gaps of the coefficient of linear expansion due to heat?"

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Built-in superimposition facilities. Three knobs for simple operation of:—

- (1) mains on/off/tone control;
 - (2) microphone or playback volume;
 - (3) radio/gram volume.
- Complete with Acos mic.

New Products

New Electron offers four- track mono

ANOTHER recorder manufactured by Elekron of Western Germany recently made an appearance on the British market announce Technical Suppliers Ltd.

The new machine is identical in appearance and performance with the earlier EMG 9/2 model, with the exception of the heads which are designed for four-track operation. Designated the EMG 9/2-4K, the newcomer is a single-speed, 3½ ips, monaural machine built to accommodate 5½ inch spools. Quoted frequency response is 30-16,000 cps and the price, including a dynamic microphone, is 59 guineas.

TELEFUNKEN HEADS

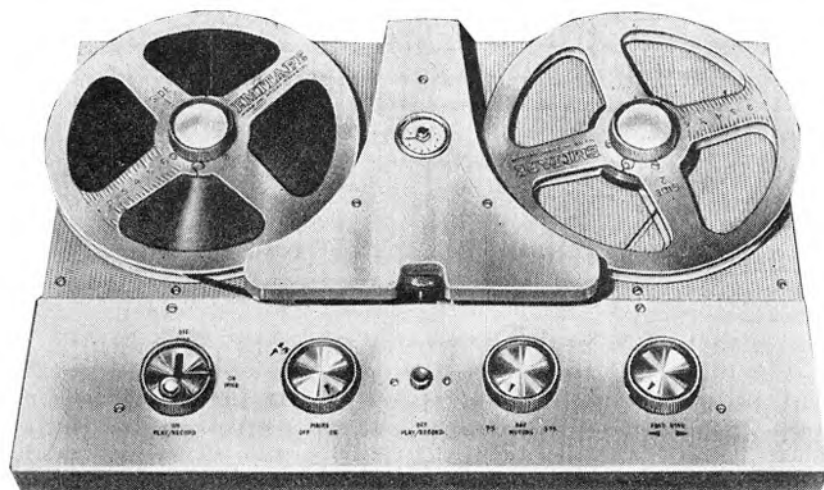
TECHNICAL SUPPLIERS LTD. have purchased the entire stock of Telefunken record/replay heads half-track type F402A, such as are fitted to many of the best Continental recorders.

Until now, no British recorder manufacturer has been able to purchase these heads for original equipment. They have cost Continental manufacturers the equivalent of six guineas each. T.S.L. offer them at two guineas retail, through dealers.

Owners of recorders with inferior heads will be able to convert by removing their present record/replay head and replacing it.

A full leaflet explaining conversion is included with each record/replay head.

Technical Suppliers Ltd., 63, Goldhawk Road, Shepherd's Bush, London, W.12.



MULTIMUSIC ANNOUNCE NEW HIGH QUALITY DECK

Four-track stereo among facilities

WHAT IS DESCRIBED by the manufacturers as "the first British deck of professional quality to be made in quantity" is about to be marketed by Multimusic Ltd. and will later be used in a new range of Reflectograph recorders.

For the present, the deck is only available to manufacturers of high fidelity equipment.

Provision is made in the head assembly unit for three heads to be accommodated each side of the capstan. Multimusic claim that it is, as a consequence, possible to produce a model for stereo quarter-track recording which will record one way, stop, reverse and record

in the reverse direction, and then switch off.

The primary feature of the design of this entirely new deck is stated to be reliability and consistency in operation.

There are no belts or interwheels, and in operation there are only five moving parts. Three of these are the motors, all specifically designed for the job, one being the main drive motor, synchronous or alternatively hysteresis synchronous, and two side motors.

Instant start and stop is possible.

The only other moving parts are the pinchwheel and a gear-driven clock-type tape position indicator. The main motor, which is direct drive, can be reversible.

An additional refinement is a provision for a connection which, when the tape recorder switches itself off, will automatically cut the A.C. supply to an amplifier and any ancillary equipment, such as a radio tuner unit, which may be connected to the recorder deck.

Open access is provided to the heads for ease of editing and, as standard, the deck is supplied for use with reels up to 8½-in. diameter. Fast wind forward and back, which is guaranteed not to stretch or break the thinnest tape, is entirely electrically controlled by a single knob, and 1,200 feet of tape can be wound in either direction in 45 seconds.

A mechanically locked "park" position holds the reels gently but firmly when the function switch is in the "off" position.

The new Multimusic deck, which has been styled by industrial designer Douglas Scott, M.S.I.A., is standard rack size—19 in. wide.

Multimusic Ltd., Maylands Avenue, Hemel Hempstead, Herts.

A mains convertor for the Clarion battery portable

A MAINS CONVERTOR for use with the Clarion Transistape transistorised recorder has been marketed by Cinesmith Products. It costs £3 10s.

The convertor is an entirely independent unit, contained in a plastic case to match the Clarion recorder. It has a lead to plug into any voltage A.C. mains supply, and a shorter lead to plug into the recorder.

The act of plugging in automatically switches the recorder batteries out of circuit; withdrawing it instantaneously restores the recorder to a battery-driven instrument.

As the speed is governed at 3½ ips, the use of the convertor enables the Clarion to be used as a second machine in the home for special effects, copying, and so on. It also, of course, enables the batteries to be kept in reserve for use out-of-doors.

The convertor is fused so that damage cannot be caused to the transistor amplifier in case of power surges or any breakdown of power supply.

Cinesmith report that the convertor has been tested for 100 hours non-stop and is now offered fully guaranteed.

Cinesmith Products, Britannic Works, Regent Street, Barnsley.

A NEW STEREO MIC.



The AKG microphone D.88

TO MEET THE increasing use of tape recorders for stereo reproduction, AKG, of Vienna, have developed a new microphone, model D.88. It comprises two matched dynamic inserts vertically mounted and housed within a tapered cylindrical perforated metal case.

A double cardioid characteristic obtains for stereo recording, but it also gives a single broad-angle cardioid for monaural use.

Each insert is matched to provide a frequency response flat from 80 to 15,000 cps, with an output impedance of 200 ohms.

With the line transformer available, (type U.400), the impedance becomes 50,000 ohms per section.

Model D.88 is supplied for stand mounting, with 15 feet of cable and standard five-pole plug. Complete with transformer, it costs £19 10s. and is available from Politechna of London, who are the distributors for Britain and the Commonwealth.

Politechna also distribute new ultra-lightweight headphones developed by A.K.G. They are normally supplied wired for single channel operation, but can be easily adapted to stereo use.

Designated type K.50, they are extremely light and comfortable in use. They are dynamic, with special coil and diaphragm assemblies to provide a

frequency response from 30 to 20,000 cps, an ideal range for monitoring requirements.

The minimum power required is 1 milliwatt; the maximum is 20 milliwatts for mono, or two 10 milliwatts for stereo. The impedance is 800 ohms.

The retail price is £8 4s. 6d., including 4 ft. 6 in. of thin plastic shielded lead.

Politechna (London) Ltd., 357, Euston Road, London, N.W.1.



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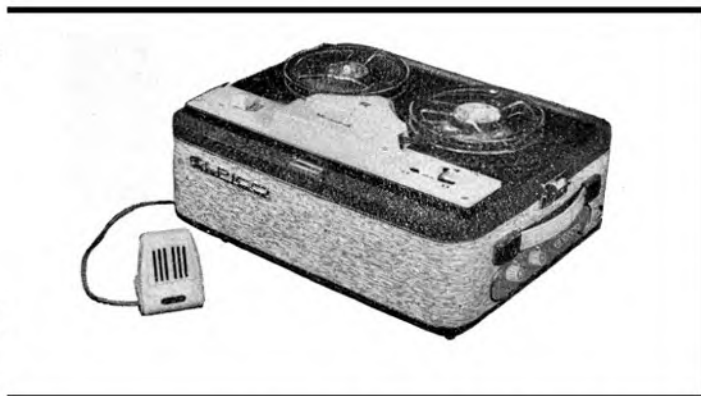
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News from the Clubs

AT the time of writing I have just received news of the start of the Rugby Tape Recording Course. From these reports, it seems that the enthusiasts attending have enrolled themselves into a most entertaining and enlightening project.

Even thick fog on the opening night was no barrier to the thirty or more persons attending. Two hardy individuals, members of the Birmingham club, had made a thirty mile journey to be present. Another enthusiastic student had arrived from Hinckley, nearly fifteen miles away.

Before the session commenced, a tape message, recorded by the Editor of *Tape Magazine*, was heard. Mike Brown, Secretary of the Rugby club and Course Organiser then introduced the first speaker and the course was under way.

The opening item was a talk, *The History and Development of Tape Recording*, given by Mr. J. O. Bannister, the President of the club. Mr. Bannister used a number of contemporary recorders to illustrate his talk and compared them with a very ancient Baird instrument. Also on the agenda for the first session was an example of tape recording, using a tape received from the Nottingham Society.

The members of the West Middlesex club seem to have had a busy time with recorders on their own account, according to their latest newsletter. The November/December issue, appearing rather late this time due to the illness of the printer and for the same reason in duplicated form, gives an account of

Edited by
FRED CHANDLER

their December 10 meeting. H. E. Saunders, who edits the report, admits that he lost track of the various types of machines in use during a frenzied recording session with a guest guitarist. Members were to be seen frantically pushing each other out of the way in an effort to record. "Goodness knows what he thought of us. We, on the other hand, were very grateful to him for being so patient," writes Mr. Saunders.

At least twelve machines were used, ranging from the two portable Stuzzi Magnettes to a Simon SP4 and a Wearite stereo model operated by Tom Pasmore, who also provided members with a short demonstration of electronic echo.

Two new members were welcomed at the meeting, one of whom, Peter Taylor, owns the stereo Grundig TK60.

Now that they no longer have the use of the hall at Uxbridge, members are making arrangements to move their headquarters to St. George's Hall in Southall, the hall found by Cecil Pearce during their recent crisis. The new hall is much bigger, has better facilities and appears to be an all round improvement.

The first meeting to be held there will be the Social on January 28. A number of items have been arranged for that evening's entertainment including a cabaret and numerous raffles. Music is to be supplied by a dance band under the direction of member Glyn Mason.

Another club has been having difficulty with club premises. In **Sheffield**, members heard the Chairman, Mr. W. N. Anderson, describe the difficulties brought about with the announcement of

an increase in rent for their rooms. The opening of the December 30 meeting was therefore somewhat clouded while members discussed the possibilities of a move to new premises, if obtainable.

Following this rather harsh news, a touch of gaiety was brought to the meeting by the introduction of a round-robin recording session. Members were called upon to talk for three minutes on a subject allocated to them by Mr. Anderson. Topics ranged from the spirit of Christmas, Audio Fairs, tape indexing, and—parking problems.

Once the mood had been established the mystery raffle was held, and won by Mr. Brazil who took home a pound of sausages, two pork chops and a packet of peas. Nice work if you can get it!

Secretary B. T. Jeeves held the floor next, giving a brief description of a visit to the Chesterfield Society. The meeting closed, aptly enough, with a round of drinks and a toast to the New Year.

The Birmingham club, which recently had a change of Secretary, has now assumed a different title. Their new official name is the **Birmingham Tape Recording and Audio Club**.

Members recently visited a neighbouring radio club, the Slade Radio Society, at Erdington, where they were entertained to a stereo demonstration. They spent an interesting evening thoroughly examining a Telefunken recorder.

Club member Barry Stephens, recently broadcast the second request programme for patients in the nearby Heath Lane Hospital.

The most recent meeting of the **West Wales** club was held on December 17 when members listened to a programme arranged by Mr. T. Islwyn Nicholas. Mr. Nicholas presented a programme of members' tapes, including a recording of a poem read by Dylan Thomas, and in doing so inaugurated a scheme arranged to provide that a different person should organise the meetings each month. The member to present the most entertaining session during the year will receive a prize.

Female members of many clubs are becoming more apparent, and the club

(Continued on page 33)



Left: Members of the Rugby Club at the opening session of their Tape Recording Course—see text. Left to right: John Bannister (President), Vera Tilcock (Asst. Sec.), Alec Lovett (Treasurer) and Eric Capell, with a Scophony Baird and a Grundig TK30. Right: Part of the audience seen during Mr. Bannister's talk. In the background Mr. Capell records the proceedings

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(Continued from page 31)

recently welcomed their first two such members. After their enrolment, members discussed the purchase of a mixer for club use. Following overall agreement on this point, the meeting turned to arranging the frequency of future meetings. It was found that the most satisfactory arrangement would be for business meetings to be held on the first Thursday in each month, and practical meetings on the third Thursday.

The E.T.E.S.S.A. Tape Club, now just over two years old, has a membership nearing the hundred mark, according to a statement in their annual report issued recently by members. The report also points out that the club is unique in that every member works for the same employer. The reason for this unusual record being that E.T.E.S.S.A. is the social section of the Post Office Cable and Wireless Service.

During the past year members have toured the factories of Grundig and Walter Instruments Ltd. and have visited the International Broadcasting studios. Further visits are intended to I.B.C. and arrangements are being made for a visit to the B.B.C.

A change of meeting dates has been announced for the London club. The next official meeting will be held on February 12 at the Abbey Community Association and thereafter on the second Thursday in the month. Dates of the recently inaugurated mid-monthly informal meetings in a Soho pub will be announced shortly.

Members were fortunate in having as their guests at their January meeting the Sales Manager of the E.M.I. Recording Materials Division, Mr. P. H. Wetherill, and Mr. L. W. Saunders, on the technical staff of E.M.I.

Mr. Wetherill gave a talk on the care and handling of tape, and Mr. Saunders

answered the technical questions put to him by members.

The second part of the evening was spent discussing the competition for the recently donated McManus Cup.

The winter edition of the **Tape Respondents International** organisation has been issued and covers a number of points for members' interests. Outstanding among these, and for further discussion, is a suggestion that a get-together be organised in London, or some other convenient spot. If you are interested in this proposal you are invited to contact the U.K. representative, Mr. Robert Ellis.

A number of requests for tape contacts have been received by Mr. Ellis. One of these requests concerns Colin Martin of 15, Shipcote Terrace, Gateshead 8, Co. Durham. He would like to hear from persons keen to use a recorder with theatrical groups, and offers to answer queries on theatre productions. Another request came from D. J. Brooks, aged 12, who would like to converse on tape in French.

Other requests came from members with interests in exchanging such items as postcards, cactus plants and folk music. For further details contact Mr. Ellis at the Schoolhouse, Whitsome, By Duns, Berwickshire.

John Penman, Secretary of the **Edinburgh** club asks me to point out that he is very happy to offer a service relaying tape messages to anyone with friends or relatives in Edinburgh. Anyone wishing to take advantage of his generous offer is invited to contact him at 22, Lauriston Place, Edinburgh, 3 (FOU 7741).

FORTHCOMING MEETINGS

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BLACKPOOL: Every Wednesday at 173, Church Street.

BOURNEMOUTH: Alternate Tuesdays at the Civil Defence Centre, Holdenhurst Road. (Next: February 9.)

CHESTERFIELD: Every 3rd Monday at the Yellow Lion, Saltergate. (February 8.)

COVENTRY: Alternate Thursdays at the Rotherham's Social Club. (February 4.)

EDINBURGH: 1st Tuesday and 3rd Sunday in month at 23, Fettes Row, Edinburgh 3.

GRIMSBY: Alternate Tuesdays at the RAFA Club, Abbey Drive West, Abbey Road. (February 2.)

LEEDS: Every Thursday at the Hope and Anchor, The Calls, Leeds 1.

LUTON: 2nd and 4th Tuesdays at 17, Dunstable Road.

MANCHESTER: Every Saturday, 6 p.m., at 20, Naylor Street, Hulme, Manchester 15.

NOTTINGHAM: Alternate Thursdays at the Co-operative Education Centre, Broad Street. (February 4.)

WEST MIDDLESEX: 2nd Thursday at the Co-operative Hall, Station Road, Hampton.

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WINCHESTER: Every Friday at the Ship Inn. Please state dates and venues for inclusion in this list, plus time if necessary. Meetings normally start between 7 and 8 p.m.

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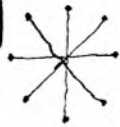
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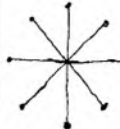
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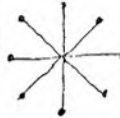
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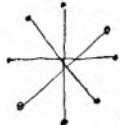
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